

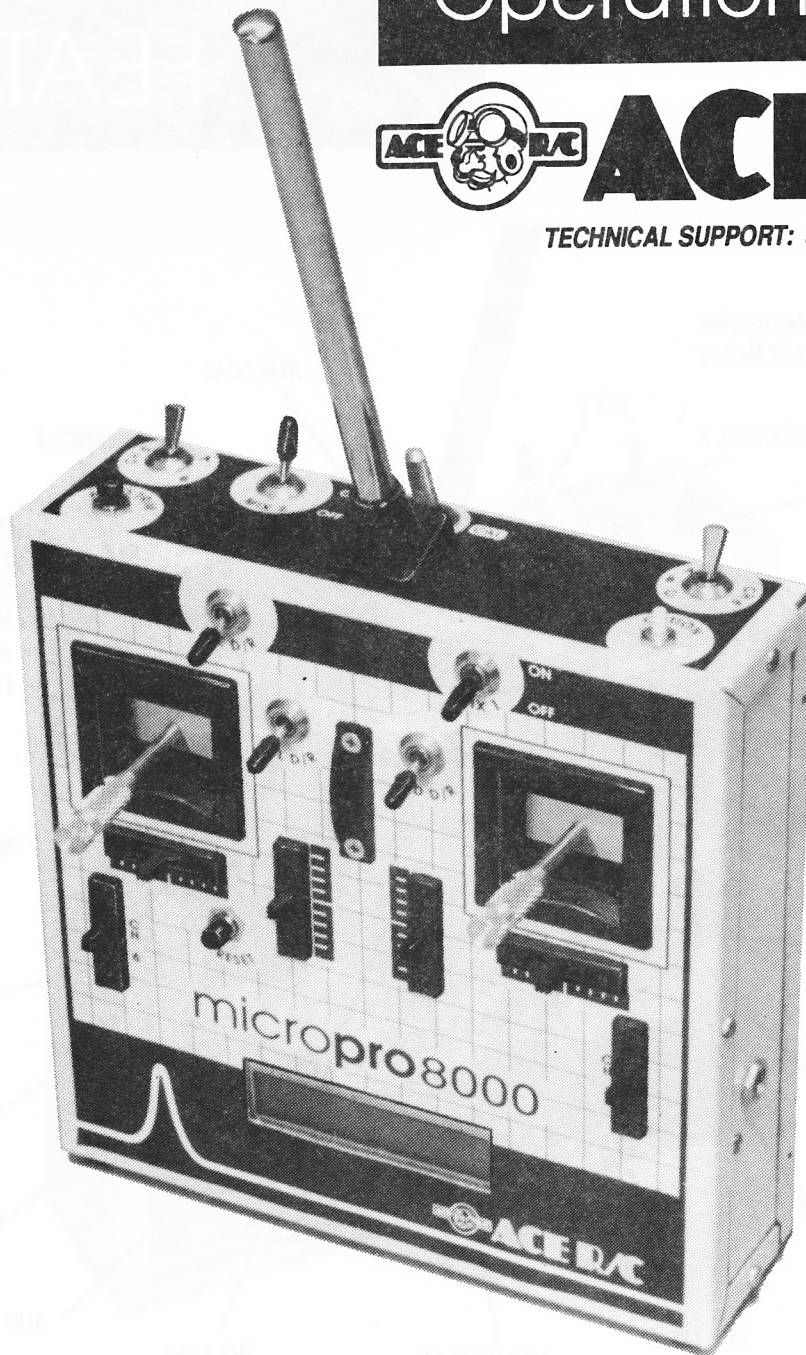
micropro8000

Operation Manual



ACE R/C

TECHNICAL SUPPORT: 816.584.6303



micropro8000

So advanced, it's simple.

micropro8000 FEATURES

AUTO TRIM in Run Mode, also toggles display between Voltmeter and Battery Timer. In CAL, it selects the equal endpoint option and selects zero mix point and absolute mixing.

ELV, AIL, & RUD DUAL RATE; also TURN ON EXPO RATE

RUD / THT STICK (CH3 & CH4)

THROTTLE PRESET; also clears MIX VALUES, MIX SWITCHES, AND EXPO SETTINGS IN CAL MODE.

CHANNEL 6

AIL TRIM

ELV TRIM

LCD DISPLAY

RUN / CAL

CHANNEL 8

OPTION BUTTON, STARTS, STOPS, and CLEARS in RUN MODE; "CLICKS" in and out of MENU, LEVELS in CAL MODE

MIX 1

ELV / AIL STICK (CH1 & CH2)

CHARGE JACK

CHANNEL 7

RUD TRIM

THT TRIM

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I. INTRODUCTION

Both the hardware and software for the micropro 8000 transmitter have been developed by Emulation Electronics, in conjunction with Ace R/C, and is manufactured under license agreement between the two parties. We would like to thank Marty and Tom Hendrickson of Emulation Electronics for their considerable talents and total commitment to this project.

WARNING AND DISCLAIMER: Improper use of this unit may cause serious personal injury to yourself, to others, or result in property damage. The user is urged to read and understand the information contained before operating the equipment. Prudent and reasonable conduct when operating this radio system is requested by the manufacturer.

Ace R/C, Inc. assumes no responsibility for accident, injury, property damage, or death incurred as a result of any use of this equipment whatsoever. The user accepts the responsibility to comply with all safety requirements, including, but not limited to, those established by all federal, state, and local governmental agencies, the regulations of the FCC (Federal Communications Commission) Part 95, and to abide by the rules and recommendations of all non-governmental bodies related to the use of this equipment, including, but not limited to, those set forth by the Academy of Model Aeronautics.

You are about to embark on an exciting adventure in radio control technology. The micropro 8000 is an R/C transmitter that possesses the awesome power of modern microprocessor computer-controlled circuitry, coupled with software that has been developed and refined to a point where you, the user, can harness the power of the computer with ease, comfort, and simplicity. You will soon find out this transmitter is so advanced, it's simple.

With this system, **you will not** be intimidated by the complexity and power you are about to unleash at your fingertips; you will only enjoy the advantages brought to you by state-of-the-art electronics and American ingenuity and thought that has made Ace R/C a leader in R/C since 1953. Don't be afraid to explore all of the possibilities of the micropro system. At every step of the way, we have installed the capability for you to recalibrate or clear whatever you have done so you can get back to "square one" and start over. When dealing with the programming of the system, you can't "break" anything, so don't hesitate to experiment.

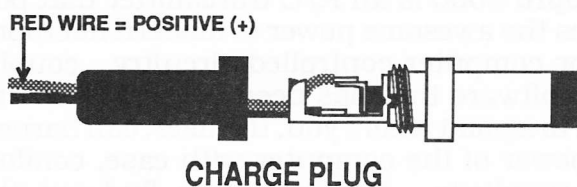
These instructions assume that you are an experienced R/C'er and know the basic operation of a typical radio control system. We will only provide the specific information necessary for set-up and use of the micropro transmitter. Nomenclature used will be for fixed wing airplanes; if you are using the transmitter in some other application, you will need to translate accordingly.

One thing we ask of you: PLEASE READ THE INSTRUCTIONS thoroughly before you pick up the phone and call us with a question. Hopefully, all questions have been covered; but, it may take a bit of reading and experimenting on your part.

II. GETTING TO KNOW YOUR micropro

A. The Batteries: Charging and Changing

Your micropro transmitter is equipped with rechargeable 800 mah/9.6V (eight cell) ni-cd batteries. Under normal operation, you can expect four to six hours of operation from the batteries before needing recharging. If you have purchased a transmitter by itself, a suitable charger will need to be obtained to charge the batteries and the furnished 0.10" pin charge plug will need to be installed (Ace P/N CC084). Refer to Illustration 1 for hookup. Make sure you maintain proper polarity. Heat shrink tubing is provided to insulate the solder connections.



Technically, the overnight charge rate for the 800 mAh batteries is 80 ma for 12-14 hours, but there is some leeway here for successful charging. Most chargers furnished with a radio system charges the transmitter at 50 ma (which would be the case if you bought a complete system). At the standard 50 ma rate, you will need to charge the batteries 24-36 hours for the initial charge, and about 18-20 hours for all subsequent charges. The transmitter should be recharged after each flying session or, if the unit hasn't been charged in over a week, it should be recharged before use.

If you have a variable rate charger, you can

charge the batteries at the overnight charge rate (80 ma) and they will be fully charged in 12-14 hours. (Charge 24 hours on the very first charge cycle.)

Note: at the overnight charge rate or less, leaving the batteries on for a couple of days won't hurt anything, so don't worry if you forget to unplug batteries after the prescribed time.

If you want more information on the care of Ni-cd batteries, Ace has a "Battery Basics" video tape (Ace P/N 30G11) or written Ni-cd Data Sheet (free, send a SASE) which explains the details of ni-cds including cycling. We manufacture a whole line of ni-cd charging and cycling equipment to fit any need. Call us for details.

Because of the multiple airplane memory and the possible need for more operation than the batteries can supply, your micropro has a removable, replaceable, "quick-change" battery pack.

To access this pack, as well as the RF Deck (see next section), the transmitter has a snap-on back. Just press in on the sides of the transmitter and the back will easily come off. Do so, and notice that the batteries are connector wired with a three pin Deans connector pair and are attached to the back with Velcro. To remove, simply unplug and peel the pack off the back. Additional battery packs are available from Ace R/C (P/N 38K800M), or you can make up your own series wired 8 cell ni-cd packs with a Deans 3 pin female connector, heat shrink tubing or electrical tape, and readily available self-adhesive Velcro. Please don't attempt to make up your own packs unless you are confident you have the tools and capabilities to do so.

After you have installed a freshly charged pack, carefully snap the back on, making sure the pack and BOTH RF Deck connectors **are securely plugged in.**

NOTE: this transmitter's memory is "non-volatile"; that means that loss of battery power through discharge or disconnection doesn't affect anything so don't worry about losing your set-ups by disconnecting the batteries, it won't happen.

B. The RF Deck

The portion of the micropro transmitter that broadcasts the commands to the receiver is the RF Deck. It is on a specific frequency or channel as indicated on frequency plate that is exposed on the outside of the back. The crystal in the RF deck is also labeled with the frequency/channel. The RF Deck is attached to the transmitter's snap-on back by means of two 2-56 bolts, which also hold the frequency plate in place. Two

Deans connectors (a two and three pin) make the electrical connections. When plugging these connectors back in, make sure you observe the proper polarity on the three pin connector; the two pin connector has no polarity and doesn't make any difference how it is plugged in.

Additional RF Decks are available from Ace R/C. (P/N 11G9M)

C. The Two micropro Modes

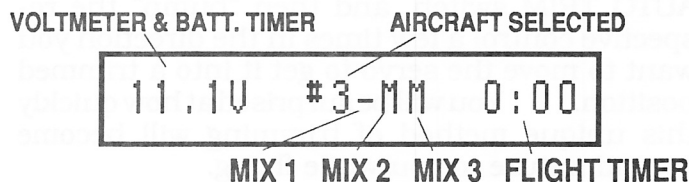
Your **micropro** runs in two basic Modes: **RUN** and **CALibrate**. You will have the transmitter in the **RUN** Mode when you are flying and in the **CALibrate** mode when you are setting up the transmitter for a particular airplane. The mode is determined by the **RUN/CAL** switch located behind the antenna. For safety, this switch is a locking type switch; the bat on the switch has to be lifted to be able to switch between the two modes.

D. The micropro LCD Display

The LCD digital display on the front of the transmitter is your communications link throughout your **micropro** experience. It will tell you all you need to know about using and setting up this transmitter and will display your interactions with the transmitter as you program its powerful computer.

As we proceed through the instructions, we will show you how the display reacts to your inputs.

III. THE RUN MODE



In the **RUN** mode, you have a maximum of eight channels of command available to you. The normal four stick channels (three neutralizing and one ratcheted): Elevator (Ch. 1), Aileron (Ch. 2), Rudder (Ch. 3), and Throttle (Ch. 4); Channel 5, which is a two position switch normally used for retracts; Channel 6 and 7, which are proportional levers, and Channel 8, a three position switch. If you are operating a seven channel receiver, Channel 8, when used with the mixer function, can be used to give you presets for various purposes which we'll cover later.

If for any reason, you wish the transmitter to broadcast less than eight channels, it can be changed to 4, 5, 6, or 7. If less than eight channels are selected, the switches or levers that normally control those functions are simply ignored unless you use the unused channel as a Mix "FROM" channel. That will be explained the Special Functions section of the instructions.

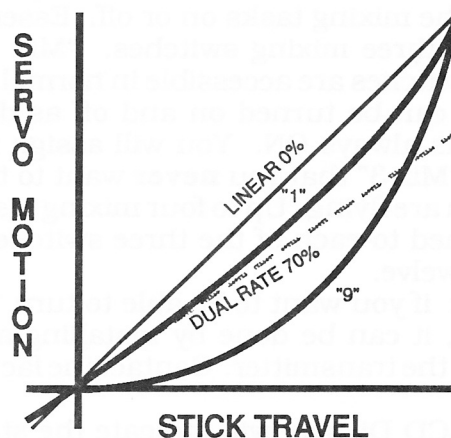
Other features that are available in the **RUN** mode are:

A. Dual Rates

Dual rates allow the user to have two different sensitivities on the three neutralizing stick controls (Elevator/Aileron/Rudder.) Each primary control stick has a toggle switch associated with it that allows the user to select either rate. The rates are determined by the endpoints that are set in the **CALibration** routine.

The dual rate can be either less than, equal to, or more than the normal rate, depending on your preference. If exponential rate is enabled, it will be turned on when the switch is in the up position.

B. Exponential Rates



THE EXPONENTIAL CURVE

Exponential Rate is exponential curving of stick travel versus servo motion. On the three neutralizing channels, exponential rate "softens" or desensitizes the stick around neutral. When you are flying with the exponential rate on, movements of the stick around neutral will result in little servo motion. With experience, exponential rate makes it much easier to fly smoothly when flying sensitive airplanes.

Exponential rate on the throttle stick desensitizes the stick at low throttle so stick movement versus RPM response can be more of a one-to-one relationship because most carburetors have non-linear response.

The amount of exponential rate is determined for each channel in the **CALibrate** mode. It can be set from "0" (which is off) to "9" (which is the most available). On the three neutralizing channels, the Dual Rate switches serve double duty and will engage or disengage exponential rate. When the dual rate switch is in the up position, the exponential rate curve you have chosen is turned on. The endpoints of servo travel will remain the same as they normally are for this switch position.

If exponential rate is enabled for throttle, it is always on.

C. Mixing

1. Universal Mixing

The **micropro** offers totally universal mixing. You will find when you get to Mixing in the calibration section of the instructions, you can program limitless mixing capabilities for any imaginable requirement.

Up to twelve mixing tasks can be assigned to mixing switches in order to have the capability of turning the mixing tasks on or off. Essentially, there are three mixing switches. "Mix 1" and "Mix 2" switches are accessible in normal operation and can be turned on and off as desired. "Mix 3" is always ON. You will assign mixing tasks to "Mix 3" that you **never** want to turn off when you are flying. Up to four mixing tasks can be assigned to each of the three switches for a total of twelve.

(Note: if you want to be able to turn "Mix 3" on or off, it can be done by installing another switch in the transmitter. Contact the factory for details.)

The LCD Display will indicate the status of the mixing switches. If an "M" appears in the "Mix 1", "Mix 2", or "Mix 3" locations, that particular switch is on. You will note that the "M" is always displayed for "Mix 3", indicating that it is always on.

2. Pre-Programmed Mixing

As a short cut, there are three mixing functions that are pre-programmed in your **micropro** that you can access. All of these are always on and not affected by the mixing switches.

Aileron Differential: This feature allows you

to control the amount of up versus down travel on each individual aileron in order to do away with the adverse yaw caused by the ailerons moving downward, particularly in gliders and high winged powered planes.

V-Tail: This feature mixes elevator into rudder and rudder back into elevator for a "V-Tailed" airplane application.

Elevon: The best example of Elevon mixing is a delta winged airplane that uses the two control surfaces at the rear or the wing for both pitch (elevator) and roll (ailerons).

D. AutoTrim

AutoTrim allows you to trim the aircraft by only using a push button switch and not removing your hands from the sticks. AutoTrim is activated by pushing the AUTO TRIM switch which moves the servos in the same direction in which the sticks are displaced from neutral. This movement of the servos will be at a slow and controlled rate (this is called **slewing**) so there will be no quick movement of the aircraft. **All** three neutralizing channels (Elevator/Aileron/Rudder) are effected by AutoTrim if their stick is displaced.

For gross trimming on the initial flight of a new, out-of-trim model, displace the sticks as necessary to fly the model "straight and level" and press the auto-trim switch. As you continue to fly the airplane straight and level with the auto-trim button pushed, you will notice that eventually, the sticks will be in the neutral position as the airplane flies in the desired attitude.

After the plane is roughly trimmed by this method, the best way to "fine tune" the AutoTrim is to start with the control in neutral, push the AUTO TRIM switch, and then "bump" the respective control a few times in the direction you want to move the servo to get it into a trimmed position. You will be surprised at how quickly this unique method of trimming will become second nature to you while flying.

The amount of offset from neutral the AutoTrim feature has created can be read and then incorporated as a new neutral, or you can mechanically trim the airplane with its linkage and return to the transmitter's normal neutral by zeroing out the AutoTrim. We will explain either procedure in the **CALibrate** section of the manual.

The speed at which the servos "slew" can be controlled. Also, if desired, the AutoTrim feature can be turned off. See the section on Changing the AutoTrim Slew Speed in the **CALibrate** section.

E. Manual Trim

Besides AutoTrim, your micro**pro** is equipped with normal, manual trims for the four primary stick channels: Elevator, Aileron, Rudder, and Throttle. The sensitivity of the trim levers is programmable in the Servo Calibration menu of the **CALibrate** mode from 0% to 50% of the normal throw and there are two options on the throttle trim which will be discussed later.

As it comes, your micro**pro** is set up in the "cross-trim" configuration; i.e., elevator and aileron trims are on the left side of the transmitter and controlled by your left hand and the rudder and throttle trims are on the right side of the transmitter and controlled by your right hand. This allows you to trim the airplane without removing your hand from the control stick.

If you want a different mechanical configuration for your trims, it is a simple matter of swapping connectors. Remove the back from the transmitter, unplug the RF Deck and batteries, and set the back aside. Look at the upper left hand corner of the encoder PC board and observe the four connectors that are plugged into the board; these connectors are wired to the trim levers. Note that the PC board is marked "ELV, AIL, RUD, and THT." If you want to convert to "standard trim," simply swap the ELV and THT connectors and the AIL and RUD connectors. When plugging them back in, make sure you maintain the proper polarity; i.e., the red wire should always be on the left. There is another check for proper polarity. Look on the bottom of the connector and observe the "1" stamped into the plastic. When it is plugged in, the "1" should correspond with the pin that is marked with a small vertical line printed on the PC board.

Now reinstall the back, **MAKING SURE** you plug **BOTH** connectors into the RF deck and the battery pack is plugged in.

NOTE: if you have swapped the trims around, you **must** perform the Set Joysticks routine. (Section VII.)

F. Voltmeter

The LCD Display normally shows the voltage of the micro**pro**'s eight cell ni-cd battery pack, depending on the state of charge of the batteries. Normal operating voltage will be over 11V when the batteries are freshly charged and 9.6V is the minimum operating voltage. When the voltmeter goes below 9.6V, the batteries are becoming discharged, and a new pack needs to be installed or the existing pack needs to be recharged.

When the batteries reach 9.6V, the voltmeter display starts to blink and when the voltage goes down to a dangerous level, (9.4V) the audio alarm sounds continuously to warn you to stop operation immediately.

G. Battery Timer

You also have a Battery Timer that will tell you how many minutes the transmitter has been on since the last time the batteries were charged. It is not automatic and has to be reset in the Special Functions menu of the **CALibrate** mode when you recharge the batteries in order to do its job. Instructions will follow.

To display the Battery Timer, push the AutoTrim button when the transmitter is in the **RUN** mode and **all the sticks are at rest in neutral**. Now the display will show the Battery Timer instead of the Voltmeter. It is shown in minutes from 000 to 999. To return to the Voltmeter mode, push the Auto-trim button again and the Voltmeter will be displayed.

H. Flight Timer

The micro**pro** has a "count-up" or a "count-down" flight timer which is displayed on the LCD. You determine which configuration in the Special Functions menu of the **CALibrate** mode.

To activate the flight timer in the **RUN** mode, click the Option Switch once to start the clock, again to stop the clock (display will blink), and again to clear the clock.

In the "count-down" mode, the Audio Alarm will alert you as you reach zero as follows: at one minute, it will beep three times; at 30 seconds, it will beep twice; at 10 seconds, it will beep once; and, at 5 seconds, it will beep each second until it reaches zero.

I. Throttle Preset

When pushed and held, the throttle preset button will move the throttle servo to a pre-programmed setting. This feature is designed primarily to kill the engine upon command. Or, it can take the throttle channel servo to any setting desired for whatever purpose; for example, it may be a preset flap or spoiler position for gliders. It is programmed in the **CALibrate** mode.

J. Setting Engine Idle in the RUN Mode

A handy feature of the micropro is that you can set the LO throttle endpoint while in the **RUN** mode. With this feature, you can have the engine running and easily set the engine's idle RPM without having to go into the **CALibrate** mode. To do so, while in the **RUN** mode, push and hold the AutoTrim button first and then the Throttle Preset button, in that order. While still holding both buttons down, "slew" the throttle servo higher or lower using the elevator stick. (Refer to the **CAL** instructions to define the "slewing" technique; it will become automatic as you learn to use the micropro.) **CAUTION:** this process must be done while the plane is on the ground and while someone is holding the airplane because all the other functions are deactivated while using this feature. Be sure to depress the switches in the proper order: first the AutoTrim and then the Throttle Preset button; when you release them, the transmitter will return to the normal run mode with only the throttle servo LO endpoint being affected, nothing else.

To summarize:

1. Push and hold AUTO TRIM.
2. Then push and hold PRESET.
3. Slew throttle servo with ELEVATOR STICK.
4. Release both buttons, keeping the throttle stick at idle.

K. Throttle Trim Options

In the Special Functions menu of the **CAL** mode, you can determine which of two options are turned on for the throttle trim function; they are either:

1. The "T" (throttle trim) option, which causes the throttle trim lever to be effective only while the throttle stick is in the LO throttle position. That way, the HI throttle endpoint setting stays the same, no matter what the throttle trim lever position is.

2. Or, the "N" (normal trim) mode, which allows the throttle trim lever to be effective throughout the entire throttle stick movement.

L. Eight Aircraft Memory

The micropro 8000 has the considerable ability to program eight different aircraft: **All** of the flight parameters for a particular airplane are stored away in memory, and are recalled by the SELECT AIRCRAFT # menu in the **CALibrate** mode. When in the **RUN** mode, the aircraft

number selected is displayed on the LCD.

M. The Audio Alarm

The micropro 8000 is equipped with an audio alarm which "beeps" when certain things happen.

One, when you switch from the **RUN** mode into the **CALibrate** mode, the alarm will beep three times to tell you that you are going into a different mode. Also, if the transmitter is in the **CALibrate** mode when you turn it on, it will beep three times to warn you that you are not in the proper mode to fly with the transmitter.

Two, when the batteries reach a dangerously low voltage level (9.4V), the alarm emits a constant beep and operation should be ceased as soon as possible.

Three, in the countdown mode, the Audio Alarm gives an alert of when the countdown is reaching the end. It will beep three times when the timer reaches one minute, twice at 30 seconds, once at 10 seconds and once every second from 5 seconds to zero.

IV. THE CALIBRATE MODE

All the programming is done in the **CALibrate** mode. You enter the **CALibrate** mode by moving the **RUN/CAL** switch to **CAL**. As a safety measure, you will have to lift the switch lever to get it to move. When you go into the **CAL** mode with the transmitter on, the Audio Alarm will beep three times. If you are already in the **CAL** mode when you turn the transmitter on, the alarm will also beep three times.

A menu system will verbally guide you through the calibration procedure by displaying your actions on the LCD, making the setup easy.

You **will be learning** three basic moves which will be almost all you need to know to unleash the power of your micropro:

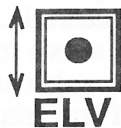
-To page through the menu left and right, you move the aileron stick left and right.



-To move deeper into or out of the menu structure, you click the option button.

"CLICK"

-To increase or decrease the calibration values, you move the elevator stick up or down.



Another aid to calibration of the **micropro** is the Flow Chart. This Flow Chart is your road map to the **micropro** system. It guides you to a particular point in the **CALibrate** mode where you might want to go; or, it will tell you how to get out of a particular spot if you are lost. Once you gain familiarity with the system, you will find that if you need to refer to the instructions at all, you will only need to look at the Flow Chart.

In the process of set-up, you can have the receiver in the airplane turned on and actually watch the servos react to your inputs. That way, you can correlate actual servo motion to what you will see displayed.

Another feature of this transmitter that is a help in set-up, is the ability to, upon command, move all the servos to their center of travel, no matter what. That simplifies things when you are mechanically setting up a given airplane.

A. Glossary of Terms:

ABSOLUTE MIXING: Available only when the "FROM" mixing channel is a neutralizing channel. It causes the "TO" channel to be affected in the same direction by the "FROM" channel, no matter which way the "FROM" channel stick is deflected from neutral.

DIGITAL PULSE METER (DPM): The display of the actual pulse width being transmitted to the receiver measured in milliseconds. The width of the pulse determines servo position. Normal operation is 1.50 ms neutral \pm 0.05 ms. The **micropro** will not transmit beyond 0.80 and 2.10 ms.

"FROM" CHANNEL: The channel that provides the input from which mixing occurs. Also known as the "master" channel.

PAGE RIGHT OR LEFT: Move the aileron stick off neutral to the right or left and return to neutral. This will change the menu page displayed to the

next page either right or left.

SLEW UP OR DOWN: Move the elevator stick off neutral upwards or downward and hold. The number being displayed will increase or decrease until the stick is returned to neutral.

SLEWING SERVOS: When the computer "slews" a servo, it moves in a smooth, slow manner that prevents abrupt adjustments.

"TO" CHANNEL: The channel that gets mixed to by the stick input of the "FROM" channel. Also known as the "slave" channel.

TOGGLE RIGHT OR LEFT: Move the aileron or the rudder stick off neutral either right or left and return to neutral. This will cause a particular item on the display to change to the next item.

TOGGLE UP OR DOWN: Move the elevator stick off neutral either upward or downward and return to neutral. This will cause a particular item on the display to change to the next item.

ZERO MIX POINT: The "FROM" channel's position when no mixing occurs. It is in neutral on the three neutralizing channels. On the non-neutralizing channels, it can be set for either the upward, downward, or middle position of the switch or lever. It is selected by pushing the **AUTO TRIM** button in the **SET MIXING VALUE** menu.

B. Selecting the Aircraft

We use this procedure to select the aircraft (#1 through #8) for the purposes of flying it in the **RUN** mode or setting it up in the **CALibrate** mode. It will serve as your first exercise in using the **micropro**'s powerful features; refer to the Flow Chart as you progress.

Begin by turning the transmitter on and switch into the **CAL** mode. The following will be displayed:

SELECT AIRCRAFT #

You are at Level One in the menu structure and on Page One.

Now, using the aileron stick, "Page Right" through this level of the menu. To do this, simply move the aileron stick to the right and return to neutral. Note that the display has changed to the next page in the menu. Repeat again and again

until you come back to SELECT AIRCRAFT#. Now for exercise, "Page Left" through this level of the menu. To do this, move the aileron stick to the left and return to neutral. Repeat until you return to SELECT AIRCRAFT#. Visualize this level of the menu as a continuous loop that you can move right or left in by using the aileron stick.

You have just learned one of the basics of micropro operation!

Now, learn the second basic by clicking the OPTION button while the display reads SELECT AIRCRAFT# which will move you deeper into the menu structure which we call Level Two.

The display reads:

AIRCRAFT NUM = 1

You will now learn the third basic of calibration which is to "Slew" the displayed value up or down. To do this, move the elevator stick upward from neutral and hold. Watch the AIRCRAFT NUM increase in value up to 8 and then loop around to 1 and continue to increase. Release the stick to neutral and note that the number stays the same. Now move the stick downward and hold, watching the number decrease in value. It too, continues to loop around until you neutralize the stick.

With the desired aircraft number displayed, click the OPTION button to move back upward in the menu structure to Level One and watch the display read once again:

SELECT AIRCRAFT #

In just a few minutes, you have just learned almost all you need to know about the calibration procedure for your micropro! Easy, wasn't it? The same basic moves will serve you throughout the micropro experience.

In order to return to the RUN mode, simply switch back to the RUN mode while in Level One of the menu structure and you are ready for operation.

C. Calibrating the Servos

1. Setting Neutrals, Normal and Dual Rate Endpoints, and Trim %

The second page in Level One of the menu structure lets you set up the servos for each of the transmitter's eight channels. The parameters are: both endpoints of servo travel (including the dual rate switch settings); the neutral position; and, the sensitivity of the manual trim lever for the four stick channels. What is traditionally known as "servo reversing" is performed when you set endpoints. We will cover each one in detail.

Go into the **CAL** mode and SELECT AIRCRAFT # appears. Page Right to:

CALIBRATE SERVOS

Click the OPTION button to move to Level Two and the following will appear:

ELEVATOR

Now, with the aileron stick, Page Right and Left through Level Two of the CALIBRATE SERVO menu page to familiarize yourself with this level. Note that we cover all eight channels, plus a "SAVE NEW VALUES", an "EXIT THIS MENU", and an "INITIALIZE SERVO" function. We will cover each of these in detail.

Note: If you want to exit this level of the menu for any reason, you can do so two ways. One, page to the EXIT THIS MENU function and click the option button; you will move back up to Level One of the menu. The other way is to simply switch the **RUN/CAL** switch back to **RUN**.

Return to:

ELEVATOR

There is a Third Level to the CALIBRATE SERVOS menu. Click the OPTION button to go to the Level Three. The following is displayed:

SET DN ELV 1.90

Now, Page Right and Left to see the four parameters that we will set at this level: SET DN (down) ELV, SET UP ELV, SET NU (neutral) ELV, and SET MTRIM (manual trim)= 25%. Return to SET DN ELV.

As you would surmise, we are now ready to set the elevator servo's endpoint of travel for full down elevator. We will set this endpoint for both dual rate switch positions.

You will now be using an important feature of the micropro system, the Digital Pulse Meter (DPM) which is displayed on the right side of the LCD. It is a display of the actual pulse width of the signal being sent by the transmitter. It dictates servo position and is measured in milliseconds. With most systems, neutral is normally 1.50 ms. (Futaba G AM is 1.31 ms). Generally, throw on both sides of neutral is 0.50 ms (1.00 ms to 2.00 ms.) No matter what, the micropro limits out at 0.80 ms at one extreme and 2.10 on the other and will not ever transmit beyond these extremes. Don't let these numbers alarm you. Dealing with them will soon become second nature and you will find having a Digital Pulse Meter (DPM) displayed makes set-up a breeze.

SET UP ELV ↑ 1.90

Now, let's discuss the dual rate switch. Flip the ELV D/R switch "up" and observe that an "up" arrow appears on the display, indicating the dual rate switch position. Whatever servo travel endpoint you program into the micropro will be the one that occurs when the dual rate is up, whether that be more than, equal to, or less than the endpoint programmed for the "down" switch position. Now, flip the switch down and watch the arrow disappear.

Once again, the display should read:

SET DN ELV 1.90

Using the elevator stick, "slew" the endpoint setting for DN elevator. The Digital Pulse Meter (DPM) will increase in value when you move the elevator stick upward and visa versa. Note that

the DPM limits out at 0.80 and 2.10 ms. Also, note that as you displace the stick more and more from neutral, the speed that the DPM changes increases. When you return the stick to neutral, the DPM stops changing.

Now turn the receiver on. Watch the elevator servo as you use the elevator stick to change the endpoint setting. It will move in direct relationship to the DPM display. "Slew" the servo until you get the desired position for full down elevator. Note the DPM. It should display a number that is close to either 1.00 or 2.00.

That's all there is to it! You have just set the "down" elevator endpoint.

SET DN ELV ↑ X.XX

Flip the elevator dual rate switch up and note that the arrow is displayed. Set the desired amount of "down" elevator for this switch position. It can be greater than, the same as, or less than the endpoint for the "down" dual rate switch position.

SET DN ELV ↑ *X.XX

We will now discuss another feature of the micropro that is available for all three neutralizing channels (elevator, aileron, and rudder). If you want the other endpoint setting to be the same on the other side of neutral (equal throw), you can do so by pushing the AutoTrim button while in this menu. An (*) will appear on the display. This tells the computer to position the UP endpoint an equal amount away from neutral as the DN endpoint, no matter what the UP endpoint setting may show on the display when in the SET UP ELV menu. To turn this feature off, push the AutoTrim button again, and observe that the (*) disappears.

Note that this setting is independent of the Dual Rate switch. If you want this feature in the Dual Rate mode, you will need to turn it on by pressing the AutoTrim button while the dual rate switch is up and the "up" arrow is displayed. This allows you the ultimate in versatility.

SET UP ELV 1.10

Enter this menu by paging right from SET DN ELV. You are now ready to set the "UP" elevator servo endpoint setting by slewing the DPM up or down with the elevator stick. The procedure is exactly the same as the "SET DN ELV" except, of course, you are setting the UP elevator endpoint instead of the DOWN endpoint.

SET NU ELV 1.50

This is the next menu available by paging right from SET UP ELV. It, as the menu implies, sets the elevator servo's neutral position. Usually, this setting should stay at 1.50 ms. (1.31 ms if you are using Futaba G servos.)

If you have used the AutoTrim feature and want to permanently store the new neutral setting, this is where you will do that. We will describe how to do that when we cover the Special Functions menu page.

ELV MTRIM 25%

This menu is one page right from the SET NU ELV and is used to set the sensitivity of the manual trim lever for elevator. It is expressed in terms of a percentage of the normal stick throw. In other words, if it is set at 25%, full excursion of the trim lever will be 25% of normal stick travel. It is slewed up and down with the elevator stick and limits out at 0% and 50%.

You can page right and left through the Third Level of this menu until you have the elevator servo set up as desired. When satisfied, "click" the option button to return to the Second Level: ELEVATOR will be displayed.

2. Saving the Settings

NOTE: None of your settings will be saved until you go to the SAVE NEW VALUES menu. We will cover that now.

SAVE NEW VALUES

As you can see from the Flow Chart, SAVE NEW VALUES is an important page in the Second Level of the CALIBRATE SERVOS menu. Here you will save the settings that you have inputted into the micropro. Nothing you have done will be permanently stored until you do so with this operation. While in the Second Level of the CALIBRATE SERVOS menu, page left or right until you reach the SAVE NEW VALUES display. You don't have to save for each change you make; you can make several changes and save them all at once.

Important: When you perform the SAVE NEW VALUES routine, any neutral offset caused by the AutoTrim feature will be zeroed out. If you want to permanently install the neutral that the AutoTrim has produced, you will have to read the offset value in the SPECIAL FUNC(tions) menu under READ ATRIM VALUE, then increase or decrease NEUTRAL by that amount. This will be covered in more detail later.

Now "click" the option button and the following is displayed:

YOU SURE? Y (N)

You can toggle between the Yes (Y) or No (N) statement with the aileron stick. If you want to save the new settings, toggle to (Y) and click the option button. The display will hesitate and then indicate:

STORAGE DONE

And automatically return to:

SAVE NEW VALUES

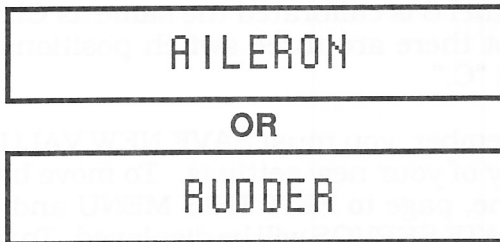
This indicates that storage is done and the parameters are now in memory and will remain there until you make a change and SAVE NEW VALUES again. You can go to the RUN mode or turn the transmitter off without losing anything.

Note: If you want to return to Level One of the menu structure, page right to EXIT THIS MENU

and click the Option button. CALIBRATE SERVOS will be displayed and you can page right or left in this level.

If you want to go to the run mode, simply flip the **RUN/CAL** switch to **RUN**. If you want to turn the transmitter off, do so. But, remember that none of your settings will be saved unless you have performed the SAVE NEW VALUES routine.

You have completed the calibration of the Elevator. Now let's do the other channels. Return to the CALIBRATE SERVOS on Level One in the **CAL** mode. Page right to:



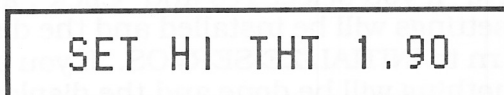
While in either one of these menu pages, click the option button to get to Level Three and observe that both of these channels set-up exactly like the ELEVATOR, except you are setting up the RT (right) and LT (left) endpoints. The "up arrow" for setting up the dual rate switch and the (*) for having equal endpoints on both side of neutral (activated by pushing the AUTO TRIM button), work exactly the same.

As with the ELEVATOR set-up, you turn the receiver on in the airplane and observe the control surface movement as you proceed through the calibration of the aileron and rudder servos.

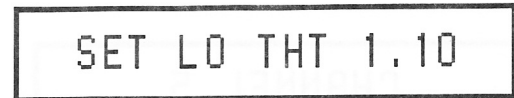
If you need review, re-read the preceding instructions. As with the ELEVATOR set-up, none of your values will be saved until you perform the SAVE NEW VALUES routine.



The routine for calibrating the throttle servo is very similar to what you have done so far with a few exceptions. Click the option button to:



Page right to:



You use the elevator stick to once again slew the servo to the desired position for HI (high) and LO (low) THT (throttle).

Note: the LO THT endpoint can be changed in the **RUN** mode. It is the only servo parameter that can be changed in this mode. Refer to "Setting Idle in the **RUN** Mode" section of the **RUN** mode instructions. Now page right to the next menu:



This routine allows you to set the desired location for the throttle servo to assume when you push the PRESET button in the **RUN** mode. As usual, you use the elevator stick to slew the DPM to the desired reading. Page right to:



This routine sets the sensitivity of the throttle's manual trim lever just like the other three stick channels.

Note: as before, if you want your settings to be saved in memory, you have to page to the SAVE NEW VALUES menu, click the option button, toggle to (Y), and click again.

If you ever want to go to Level One of the menu structure, page right or left to EXIT THIS MENU and click the Option button. SELECT SERVOS will appear and you can now page right or left through this level. If you want to go to the **RUN** mode, flip the **RUN/CAL** switch to **RUN**. But realize that none of your settings will be remembered unless you have done the SAVE NEW VALUES routine before going to the **RUN** mode.

Although there are a few differences, channels 5 through 8 are set up basically the same. Let's review how these channels are configured: Channel 5 is a two position toggle switch with the two positions labels "A" and "B." Channel 6 and 7 are proportional levers. Channel 8 is a three position toggle switch labeled "A", "B", and "C."

In Level Two of the Calibrate Servos menu, page to:

CHANNEL 5

Click the option button and observe:

SET A CH5 1.90

As you would expect by now, the DPM number displayed will indicate the position of the 5th channel's servo when the CH 5 switch is flipped to "A" and is slewed up or down with the elevator stick. You can have the receiver on and observe actual servo position. Page right to:

SET B CH5 1.10

By the same token, now you can set the servo's position when the CH 5 switch is flipped to "B." (Of course, none of the settings will be saved until you do the SAVE NEW VALUES routine.)

Now click back to CHANNEL 5 and page right to:

CHANNEL 6

And click the option button to get to Level Three:

SET UP CH6 1.90

In the same manner, you now calibrate the transmitter to give you the desired CH 6 servo position when the CH 6 lever is at its upward limit of travel. Then page right to:

SET DN CH6 1.10

By now, no explanation should be necessary.

Once you've set-up CH 6, click back up to the Second Level. Remember, nothing is saved until you do the SAVE NEW VALUES routine.

CHANNEL 7

AND

CHANNEL 8

Channel 7 is calibrated the same as Channel 6. Channel 8 is calibrated the same as Channel 5, except there are three switch positions, "A", "B", and "C."

Remember, you must SAVE NEW VALUES to keep any of your new settings. To move back to Level One, page to EXIT THIS MENU and click. CALIBRATE SERVOS will be displayed. To return to the **RUN** mode, flip the **RUN/CAL** switch to **RUN**. If you want to switch off, do so.

3. Turning on Default Settings

INITIALIZE SERVOS

This is the only page in Level Two of CALIBRATE SERVOS that we haven't covered. It allows you to return **ALL** of the constants for the selected aircraft back to the original factory default settings. These values will be 1.90 ms for DN ELV, RT AIL, RT RUD, HI THT, CH5 A, UP CH6, UP CH7, and CH8 A. 1.5 ms for neutrals, THT PRESET, and CH8 B. 1.10 ms for UP ELV, LT AIL, LT RUD, LO THT, CH5 B, DN CH6, UP CH7, and CH8 C. The MTRIMS will be set at 25%.

To perform this routine, click the option button while INITIALIZE SERVOS is displayed:

YOU SURE? Y (N)

Use the aileron stick to toggle between Yes(Y) and No(N). If you select Yes and "Click", all the default settings will be installed and the display will return to INITIALIZE SERVOS. If you select No (N), nothing will be done and the display will return to INITIALIZE SERVOS.

D. Mixing

1. Introduction to Mixing

Careful reading, study, and experimentation is necessary to fully utilize the micropro's powerful ability to perform unlimited mixing. We will illustrate by example; where you take it from there is entirely your choice and limited only by your imagination. If you are wanting to do a mixing task, PLEASE read and re-read this section carefully.

a. Defining the "FROM" and "TO" Channels

As the name implies, mixing is the function of taking the command of one channel and mixing it into another channel. This means that in addition to affecting its own assigned servo, a stick, lever, or switch will also affect another servo/channel. This process will define which channels are affected, how much the servos are affected, and in what direction they will move when the stick, lever, or switch is moved.

To keep our terminology clear, we will define the "FROM" channel as that stick, lever, or switch that will affect the other servo. In other words, the "FROM" channel is the channel we mix from. The "TO" channel is the servo channel that is affected by the "FROM" channel input. This is the channel that is mixed to.

b. The Mixing Matrix

		"FROM" CHANNEL							
		ELV	AIL	RUD	THT	CH5	CH6	CH7	CH8
"TO" CHANNEL	ELV								
	AIL								
	RUD								
	THT								
	CH5								
	CH6								
	CH7								
	CH8								

MATRIX CHART

The most flexible means to visualize how this

mixing can be implemented is by a matrix array in which the "FROM" channels read down and the "TO" channels read across. The intersection of the row and column is the definition of one mixing function. This definition states what kind of mixing it will be. For example, the intersection of the second column and the third row will contain the definition for mixing the Channel 2 (Aileron) into the Channel 3 (Rudder) servo output. This matrix accomplishes every possible mixing combination. It can be seen that on the diagonal of the matrix are those intersections that have a channel mixing into itself. Those intersections have been eliminated from the mixing matrix because they do not apply.

When setting-up a particular mixing task for a particular airplane, it is helpful to draw up a matrix to visualize and keep a record of your settings.

c. The Zero Mix Point

The Zero Mix Point is the position of the "FROM" channel where no mixing occurs. With the neutralizing channels (ELV, AIL, and RUD) it is always defined as neutral. With the other channels, you will be able to define it three ways: when the stick switch or lever is in the upward position, downward position, or in the middle.

In any event, the Zero Mix Point is the point of stick, switch, or lever travel where the "FROM" channel is to have NO effect on the "TO" channel.

For example, you want to add some down elevator as you give down flaps. You are using CH 6 as the flap channels and you have the upward lever position set-up as neutral flaps. As you move the lever downward, you want to mix in some down elevator to compensate. So, when the CH 6 lever is in the upward position, you don't want the elevator to be affected, so that is your Zero Mix Point when CH 6 is the "FROM" channel for the purposes of getting compensating elevator (the "TO" channel).

d. Absolute Mixing (a)

Absolute Mixing is available when any of the neutralizing channels (ELV, AIL, or RUD) are selected as the "FROM" channel. When turned on, Absolute Mixing will cause the "TO" channel to move the same direction, no matter which way the "FROM" channel stick is displaced from neutral.

For example, you want to get some up elevator when the rudder is moved either right OR left. If so, RUD is the "FROM" channel and absolute mixing is turned ON. ELV is the "TO" channel; it will be affected the same way (up) whether the

RUD stick is moved right or left.

2. Setting the Mixing Values

SET MIXING VALUES

To set-up the mixing you want, page to the SET MIXING VALUES menu in the First Level of the **CAL** mode and click the Option button to move to the Second Level; the display will read:

MIX 0% ELV>AIL

MIXING "FROM" "TO"
PERCENTAGE CHANNEL CHANNEL

The display position that now indicates 0% is the mixing percentage. It is slewed up or down with the **elevator** stick.

The display position that now indicates "ELV" is the "FROM" channel. You toggle right and left with the **rudder** stick to display the desired "FROM" channel.

The display position that now indicates "AIL" is the "TO" channel. You toggle right and left with the **aileron** stick to display the desired "TO" channel.

Experiment with the process of slewing the mixing percentage up and down; you will note that the percentage displayed can be either positive or negative which determines the direction the "TO" channel will be affected by the "FROM" channel input.

Note that the percent can actually display from ± 0 to 800%. This is to allow you maximum versatility in case you want the throw of the "TO" channel to exceed the throw of the "FROM" channel as a result of the mixing. **Generally, you will be working with mixing percentages below 100%.** In any event, if you attempt to perform mixing beyond the limits of servo throw established by the computer, (0.80 to 2.10 ms) the percentage in excess of that maximum will be ignored.

Also, experiment with toggling throughout the "FROM" and "TO" channels by using the rudder and aileron sticks. Notice that the computer will not allow you to mix a channel into itself. If you have ELV displayed as the "FROM" channel and toggle through the "TO" channels with the aileron stick, ELV will be skipped.

At any time, if you want to clear all the mixing values you have put in for a given aircraft, push

the PRESET button and all settings will return to zero. This allows you to bail out and start from scratch.

MIX 0% ↑ ELV>AIL

ZERO MIX POINT

Now, let's consider the Zero Mix Point. Use the rudder stick to toggle to a non-neutralizing channel (THT through CH 8). You will notice an arrow displayed between the percentage of mix and the "FROM" channel. Now push the AUTO TRIM button and note the direction of the arrow. Keep pushing the button and watch the arrow go from the → to the ↓ to the ↑. This arrow displays the status of the Zero Mix Point for the "FROM" channel. When the arrow is upward, the Zero Mix Point is when the "FROM" channel is in the upward location of the stick, lever, or switch; when it is down, it is when the stick, lever, or switch is in the down position; when it points right, the Zero Mix Point is when the "FROM" channel is in the middle of its travel.

When the "FROM" channel is a neutralizing channel (ELV, AIL, or RUD), Absolute Mixing can be engaged. (See definition in section "d.", page 15.) To do so, use the AUTO TRIM button to turn absolute mixing on and off. An "a" will appear on the display to indicate Absolute Mixing is on.

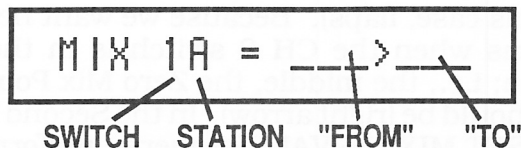
3. Setting Mix Switches

In order to use any of the mixing you have set up in the above procedure, it has to be assigned a mixing switch. Essentially, there are three mixing switches. "Mix 1" and "Mix 2" switches are externally accessible and can be turned on and off as desired. "Mix 3" is always on. (Note: if you want to be able to turn "Mix 3" on or off, it can be done by installing another switch in the transmitter. Contact the factory for details.) You will assign mixing tasks to "Mix 3" that you NEVER want to turn off when you are flying. Up to four mixing tasks can be assigned to each of the three switches for a total of twelve.

SET MIX SWITCHES

Page to this menu in Level One and click the

option button to get to Level Two. The following is displayed:



To gain an understanding as to what is happening, move the elevator stick in the upward direction to toggle up and watch the display change from 1A to 1B, 1C, 1D, 2A, ..., and 3D, then return to 1A. This tells you that you can assign up to four mixing tasks (represented by A, B, C, and D; we call them "stations") to one or more of the three mixing switches (1, 2, and 3).

Now, with "1A" displayed, use the rudder stick to toggle the "FROM" channel left and right between the eight channels available. By the same token, use the aileron stick to toggle the "TO" channel. Observe the display as you go through the channels available plus the "--" (blank) display.

In order to assign a given mixing task to a switch, simply select the mixing switch that you want to assign the task to (1, 2 or 3....realizing that 3 is the switch that is always "on"), plus one of the four stations that you can assign to a given switch (A, B, C, or D), then have the "FROM" and "TO" channel match the task that you want switched on and off with that particular switch; when you do that, that task will be controlled by the selected switch.

That's all there is to it. Remember, for each switch, you can assign up to four different mixing tasks (A, B, C, and D).

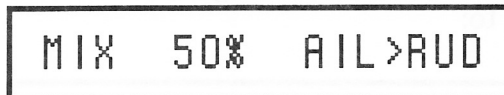
When you click the option button to return to the First Level, any of the assignments you have made will be remembered.

If you want to clear **all** of the switch assignments back to the "-->--" condition, push the PRESET button. All assignments will be cleared.

4. Mixing Examples

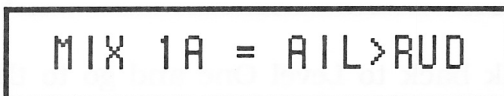
As we promised, the best way to illustrate the power of the mixing features of the micropro is by example. A few follow. One reminder: any time you want to clear out all the mixing values or the mixing switch settings and start at "square one", simply press the PRESET button while in the SET MIX VALUES or SET MIX SWITCHES menu and they all will be cleared back to zero.

One: Coupled Aileron and Rudder (CAR) is a much used mixing task that links the aileron channel to the rudder channel so that when you give aileron command, you also get some rudder movement in the same direction in order to speed up the roll rate on high winged airplanes. In this case, the "FROM" channel is AIL and the "TO" channel is RUD. There is no other mixing involved for this task. Also, a normal percentage would be around 50%; i.e., when you move the ailerons to full right or left, you get 50% of the normal rudder throw. So, you would configure Level Two of the SET MIXING VALUE menu like so:



Remember, the rudder stick is used to toggle the "FROM" channel, the aileron stick is used to toggle the "TO" channel, and the elevator stick is used to slew the percentage up and down. (Notice that the computer will not allow you to mix a channel into itself; i.e., you can't have AIL displayed as the "TO" channel and toggle the "FROM" channel to AIL without moving the "TO" channel off of AIL.)

Since you would probably want to be able to turn the mixing function on and off in flight, it needs to be assigned to either MIX 1 or MIX 2 switch. Configure Level Two of the SET MIX SWITCHES menu like so:



In this case, we are assigning that particular mixing task to station "A" on the MIX 1 switch. Remember, the rudder stick is used to toggle the "FROM" channel, the aileron stick is used to toggle the "TO" channel, and the elevator stick slews the mix switch number (1-3) and station (A-D).

Now click the option button and go into the **RUN** mode and turn the airplane on. Aileron and rudder operation should be normal when the MIX 1 switch is off. When you flip MIX 1 switch on and move the aileron stick, you will get rudder action. If the rudder movement is too much, too little, or backwards, go back into the SET MIXING VALUE menu and decrease, increase, or reverse the direction (+ or -) of the percentage of mix.

It really is that simple! You may have to experiment somewhat to get the procedure down, but once you understand the basic concept, the

unlimited world of mixing with the micropro will open up to you!

Two: For the second example, we will illustrate another common mixing function; that is, a mixer that will provide compensation for a given control input. In this case, we will describe elevator compensation for deployment of flaps; i.e., you want to get some "down" elevator when you drop the flaps so that the plane continues to fly level as flaps are dropped.

So, the "FROM" channel is Flaps (CH 6) and the "TO" channel is ELV. (This assumes flaps are plugged in to CH 6). Configure the SET MIXING VALUE to:

MIX -20% ↑ CH6>ELV

This set-up assumes that when the flap lever is up, you don't want any elevator compensation, so the Zero Mix Point is when the CH 6 lever is in the up position (up arrow). Also, you need to assign the mixing function to a switch, Mix 1, 2, or 3. (Remember, Mix 3 is always "on".)

So, go to the SET MIX SWITCHES menu and click. Say you want to assign the task to the Mix 2 switch, then configure like so:

MIX 2A = CH6>ELV

Click back to Level One and go to the run mode. With the Mix 2 switch on, you will get elevator compensation when you move the CH 6 lever downward from its full upward position. If there is too much or too little, go back into the SET VALUE routine and increase or decrease percentage. If the elevator moves in the wrong direction when you drop the flaps, change the mix percentage from positive to negative or visa versa.

Three: Third is an example of using the three position CH 8 switch for mixing purposes only. In this case, we are going to use the three switch positions to configure a glider for three different modes: launch, cruise, and seek. In the launch mode, we want some down flaps and some elevator compensation; we will achieve that mode when CH 8 is in the "A" position. In cruise, we want everything at neutral; CH 8, "B" position. When we seek, we want some up, (reflex) flaps and a little elevator compensation in order to penetrate

the wind or move quickly to the next area of lift; we'll use CH 8, "C" position for this.

So, we need to mix CH 8 into both ELV and CH 6 (in this case, flaps). Because we want neutral positions when the CH 8 switch is in the "B" position; i.e., the middle, the Zero Mix Point for CH 8 should be (right arrow). In the Second Level of the SET MIXING VALUES menu, perform the following two configurations:

MIX 10% → CH8>ELV

MIX 25% → CH8>CH6

Remember, the rudder stick is used to toggle the "FROM" channel, the aileron stick is used to toggle the "TO" channel, the elevator stick is used to slew the percentage up and down, and the AUTO TRIM button is used to change the Zero Mix Point of the "FROM" channel.

Both of these mixing tasks needs to be assigned to a switch, Mix 1, 2, or 3. For example, we always want these two mixers on, so we're going to assign them both to Mix 3 in the SET MIX SWITCHES menu:

MIX 3A = CH8>ELV

MIX 3B = CH8>CH6

Once again, note that the rudder stick is used to toggle the "FROM" channel, the aileron stick is used to toggle the "TO" channel, and the elevator stick is used to toggle through the switches and stations available.

Go to the **RUN** mode, and check operation. Note that you have many parameters to juggle in order to get the desired operation. The CALIBRATE SERVOS (endpoint) settings for CH 8 "A", "B", and "C" will determine the relationship between those switch positions and how they affect the elevators and the flaps. The directions and percentages of mix will also be in play just as they are in the previous examples. You will systematically have to make adjustments and observe their results in order to get the desired results.

FOUR: This is a bit more complicated, and

illustrates the versatility of your micro**pro**. This is another set-up for a competition sailplane. We want to be able to have the wing equipped with ailerons on the outer panels and flaps on the inner panel. Ailerons are to operate normally when you use the aileron stick. We want them both to move up when we drop the flaps to assume a "crow" condition. We also want to have a full variable camber wing and be able to move all wing surfaces slightly up or down by means of a preprogrammed three position switch.

In order to perform this task, we need a separate servo on each aileron; one plugged into the AIL channel and, in this case, the other plugged into CH 7. Flaps are plugged into CH 6 in this example. Now, for openers, configure Level Two of the SET MIXING VALUES like so:

MIX 100% AIL>CH7

MIX 50% ↑CH6>CH7

MIX -50% ↑CH6>AIL

AIL>CH7 gives you the proper aileron action.

Caution: the CH 7 lever is still active; it is not decoupled so it **must at all times** stay in the middle position to give you the proper neutral for the aileron that is plugged into CH 7. CH6>CH7 and AIL gives you the "crow" configuration when flaps are dropped. Note: if you want to decouple the CH 7 lever, simply set both endpoints for CH 7 at the same DPM reading as the neutral for aileron (usually 1.50 ms).

Assign the three tasks to any of the three mix switches desired. The "crow" capability should be able to be turned on and off. Now go to the **RUN** mode and check operation. Once again, there are several variables involved: the CALIBRATE SERVO settings for any of the channels involved, the percentage and direction of mix, plus the mechanical hookup of any given servo.

Once you get the desired operation, go back into SET MIXING VALUES and mix CH 8 into AIL, CH 7 and CH 6 in order to get the desired three position variable camber function. Refer to the example above for help doing this. Note: the "crow" mixing needs to be turned off while using this feature or you'll get unwanted mixing when you flip CH 8 to either "A" or "B".

NOTE: There are some common mixing tasks pre-programmed into your micro**pro** that you can easily engage or disengage. We will cover them after the next section.

E. Setting the Expo Values

Re-read the Exponential Rates information in the **RUN** mode section (page 5) of the manual. If you wish to engage Exponential Rate for the particular airplane you are setting up, page right in Level One of the menu to:

SET EXPO VALUES

Click the option button and observe:

ELV EXPO VAL = 0

Using the aileron stick, toggle through the selections available at this Level. Note that you can access all four stick channels (ELV, AIL, RUD, and THT). Choose the channel desired, and slew the value up and down with the elevator stick, observing that it increments from "0" to "9". The higher the number, the greater the amount of exponential curve, with "0" being completely off. Slew the value to the desired amount. Repeat for any other channel for which you want expo.

As with the mixing functions, if you wish to clear all the expo settings back to "0" (off), simply press the PRESET button while in Level Two of the SET EXPO VALUES menu page.

To exit this menu level, click the option button and you return to Level One. The expo settings will be remembered until you go back in and change them.

Once again, the up position of the Dual Rate switch for a given channel turns the expo rate on. (except throttle; it is always on) and the endpoints will be the same as those that you have programmed for that switch position.

F. Enabling Pre-Programmed Mixing

As a short-cut, the micro**pro** has some common mixing tasks pre-programmed so you can bypass the Set Mixing Values menu and simply turn those mixing tasks on. If selected, each one of these tasks are **always on** for the particular airplane you are setting up; the mixing switches

have no affect. The following are available:

1. Aileron Differential

This feature allows you to control the amount of up versus down travel on each individual aileron in order to do away with the adverse yaw caused by the ailerons moving downward, particularly in gliders and high-winged powered planes.

It requires each of the two ailerons be controlled by a separate servo hooked to two different receiver channels. When this option is selected, both the aileron channel and **Ch. 7** will be the channels used for aileron control. The control level for Ch. 7 will be disabled and have no effect on the servo.

ENABLE A. DIFF.

While in the First Level of the **CAL** mode, page right until the above is displayed. Click the option button and:

AIL. DIFF? Y (N)

If you wish to turn this feature on, use the aileron stick to toggle the parentheses to Yes (Y) and click the option button to return to Level One. If you don't want the feature, leave the parentheses on No (N) and click back to Level One. When you have turned Aileron Differential ON, it will remain on for that particular airplane until you go back into this menu and turn it off. The mixing switches have no effect on this feature.

To set the airplane up, hook everything up (remember we use CH. 7 for the additional channel needed for aileron control) and turn on the receiver and transmitter (**RUN** mode).

To check for proper mechanical hookup, move the aileron stick back and forth. The ailerons need to move in opposite directions when aileron command is given. If not, it will be necessary to make the necessary mechanical changes needed to achieve this, such as moving the linkage to the opposite side of one of the servos, or using a servo that has opposite rotation. Also, the linkage needs to set up so you get the same aileron travel versus servo rotation for each individual aileron.

Now page to the CALIBRATE SERVOS menu in the **CAL** mode. Click to Level Two and page to

AILERON. Click to Level Three. **SET RT AIL.** will be displayed. Now turn on the radio in the airplane. Note that while you are setting up this function, only the servo that is plugged into the aileron channel is being affected; the two servos aren't mixed together in the **CAL** mode. Use the elevator stick to slew the servo to give you the appropriate servo action for right aileron. If that servo action happens to be moving the aileron downward, you would want to make that amount of movement less than normal so you get the differential effect that you desire. Page right to **SET LT AIL** and repeat the set-up. Remember, you have to **SAVE NEW VALUES** if you want put your changes in memory.

Return to the **RUN** mode and observe aileron action. You should now have differential aileron operation. (The servo you have plugged into CH. 7 will follow the settings you have inputted for **AILERON**; that's why the mechanical linkage has to be the same for both servos.)

2. V-Tail

This feature mixes elevator into rudder and rudder back into elevator for a "V-Tailed" airplane application. It is enabled as follows: In Level One, page to:

ENABLE V-TAIL

Click to the Level Two and use the aileron stick and toggle to either Yes (Y) or No (N). Click back to Level One and your selection will be in effect until you go back in and change it.

Set-up is easy. First, you have to go into the **RUN** mode and make sure the surfaces are mechanically hooked up properly; i.e., when you give an elevator command, the surfaces need to move in the same direction and when you give a rudder command, they need to move in opposite directions. Also, the linkage needs to set up so you get the same travel versus servo rotation for each individual control surface.

The parameters (endpoints, neutral, and trim %) channel (elevator and rudder) is done in the **CAL** mode under the CALIBRATE SERVO menu as normal. You will note that when you are setting up the servos and have the airplane on, only the servo plugged into the elevator output will move when you are setting up the elevator channel and only the rudder servo will move when you are setting up the rudder channel; i.e., they aren't mixed while in the **CAL** mode. Don't forget to **SAVE** your settings.

Keep one thing in mind with setting up a conventional "V-Tailed" airplane: the movement of the tail surfaces when rudder control is applied is opposite to the ailerons; i.e., when you move the surfaces in such a way that you "roll" the **tail** to the right, the resulting yaw is to the left.

3. Elevons

The best example of Elevon mixing is a delta winged airplane that uses the two control surfaces at the rear or the wing for both pitch (elevator) and roll (ailerons).

To turn this feature on, page to the ENABLE ELEVON menu in Level One of the CAL mode. Click the option button to go to Level Two and toggle to the desired answer, (Y) Yes or (N) No. Click again and return to Level One. Your selection will be in effect until you go back in and change it.

To set-up, first, you have to go into the **RUN** mode and make sure the surfaces are mechanically hooked up properly; i.e., when you give an elevator command, the surfaces need to move in the same direction and when you give an aileron command, they need to move in opposite directions. Also, the linkage needs to be set up so you get the same travel versus servo rotation for each individual control surface.

The parameters (endpoints, neutral, and trim %) for the elevator and aileron channels are set-up in the **CAL** mode under the CALIBRATE SERVO menu as normal. You will note that when you are setting up the servos and have the airplane on, only the servo plugged into the elevator output will move when you are setting up the elevator channel and only the aileron servo will move when you are setting up the aileron channel; i.e., they aren't mixed while in the **CAL** mode. Don't forget to **SAVE** your settings.

V. SPECIAL FUNCTIONS

This page in Level One of the menu structure offers several special functions that can be implemented.

NOTE: The first two of these functions are independent of the SELECT AIRCRAFT # menu; whatever you select applies, no matter which Aircraft # is selected.

In Level One, page to:

SPEC. FUNCTIONS

Click down to Level Two and page right and left through the selections available, referring to the Flow Chart as reference. We shall begin at the first menu available:

A. Battery Timer

RESET BATT TIMER

Click to Level Three and observe:

RESET BTMR Y (N)

When you toggle to Yes (Y) and click, the Battery Timer is reset to zero and you will return to Level Two.

You want to do this every time you re-charge the batteries. That way, in the RUN mode, when you opt to display the Battery Timer by pushing the AUTO TRIM button, it will show you how many minutes of "ON" time have transpired since you last charged the batteries.

NOTE: at any time, to leave Level Two and return to Level One of this menu, page right or left to:

EXIT THIS MENU

When you click, you will return to Level One.

B. Flight Timer

Go back to the SPEC. FUNCTIONS menu page in Level One, click, and page right to:

SET FTMR MODE

Click to Level Three and observe:

FTMR MODE = (U) D

You can now toggle between (U) Up and (D)

Down. When you click back to Level One, the selection you made will be remembered until you change it.

When (U) Up is selected, your Flight Timer will start at zero and count up in one second increments. You use the OPTION button in the **RUN** mode to start, stop, and reset the count up timer. The count timer will read up to 99:59 and then roll over to 00:00.

When (D) Down is selected, you have chosen the Count Down Flight Timer Mode. The next menu page in Level Two will allow you to set the beginning time for the Count Down mode. Click to Level Two of the SPEC. FUNCTIONS menu and page right to:

SET START TIME

Click to:

START = (00):00

You can now toggle left and right between minutes and seconds with the aileron stick.

The selection is slewed up and down with the elevator stick. Minutes slew from 0 to 99, and seconds slew from 00 to 59.

When you have selected the minutes and seconds desired, click the option button to return to: SET START TIME.

Refer to the Flight Timer section of the **RUN** mode instructions for the specific operational features of the Flight Timer.

C. Reading AutoTrim Values

If you want to permanently install the offset from neutral that has been created by the AutoTrim, you use this feature to read that amount of offset, record it, and then incorporate it in the CALIBRATE SERVOS menu. It has to be done before you SAVE NEW VALUES because any time the SAVE NEW VALUES routine is performed, the AutoTrim settings are zeroed out. Page to:

READ ATRIM VALUE

Click to:

ELV ATRIM = 0.00

Use the aileron stick to toggle to the selections available: ELV, AIL, and RUD. The number displayed is the **amount of offset from neutral** created by AutoTrim; it will be either a positive or negative number. Record the number for each of the three channels.

Click back up to READ ATRIM VALUE and page over to EXIT THIS MENU and click. Now page right to CALIBRATE SERVOS, click to EL-EVATOR and then click to Level Three. Page right to SET NU ELV and read the neutral displayed (usually 1.50). Depending upon whether it is positive or negative, the number you have recorded for the elevator's AutoTrim offset will then need to be added to, or subtracted from the displayed neutral. Next, use the elevator stick to slew the neutral reading to the new value. Repeat for AILERON and RUDDER. Perform the SAVE NEW VALUES routine; now the new neutrals have been installed and the AutoTrim has been reset to zero.

D. Changing the AutoTrim Slew Speed/Disabling AutoTrim

You can change the speed at which the servos slew when using the AutoTrim feature. It is here that we can disable the AutoTrim feature, if desired. To do either, go back into the SPEC. FUNCTIONS menu, click to Level Two, and page to:

SELECT ATRIM SPD

Click to:

ATRIM SPD = 100%

Use the elevator stick to slew the percentage figure. 100% is fastest. For normal operation, you will probably chose a figure between 50 and 100%.

If you select 0%, the Auto Trim is turned off; i.e., disabled.

E. Selecting Throttle Trim Type

There are two selections available for the throttle trim. Re-read the section in the **RUN** instructions to make your choice.

While in Level Two of the SPEC. FUNCTIONS menu, page to:

SET THT TRIM MOD

Click to Level Three:

THT MTRIM = T (N)

Use the aileron stick to toggle the selection between "T" (Throttle) and "N" (Normal). Whichever is selected when you click back to Level Two is the one in effect.

F. Selecting Number of Channels Outputted.

You can change the number of channels that the transmitter broadcasts by going into Level Two of the SPEC. FUNCTIONS menu and paging to:

SELECT CHANNEL

Click to:

CHANNELS = 8

The elevator stick will slew between 4 and 8. When you have made your selection, click back up to Level Two.

When less than eight channels are selected, the appropriate switch or lever will be ignored unless it is selected as a "FROM" channel and mixed "TO" an active channel.

G. The "Center Servos" Feature

This features makes all servos that are plugged into the receiver go to their center of travel. There

are two selections available for this feature, 1.50 ms and 1.31 ms. Most servos center at 1.50 ms pulse width, but Futaba G AM series center at 1.31 ms. To access this feature, go to the SPEC. FUNCTIONS menu, click to Level Two, and page to:

CENTER SERVOS

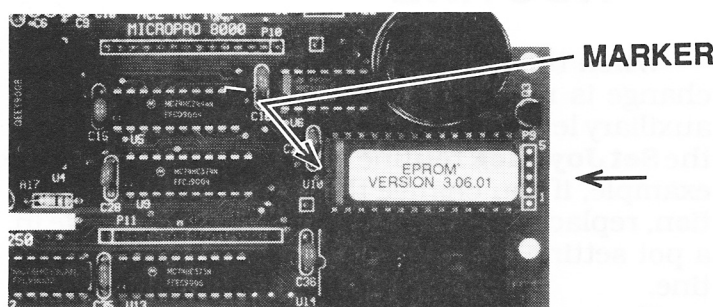
Click to Level Three and observe:

(1.50) 1.31 ms

The aileron stick allows you to toggle between the two choices.

Now, if the receiver is turned on, all servos will move to the selected center of travel and remain there until you move out of this menu.

VI. SOFTWARE UPGRADES



All of the programming for your transmitter resides on a removable 28 pin IC device called an EPROM.

As changes and improvements are available for your micropro, we will inform you (if you fill out the Registration Form and mail it to us) and will offer a economical swap program so you can get an upgraded EPROM for your transmitter. We can do this because the EPROM is re-programmable at the factory. This is one of the many advantages you have as a micropro owner!

To replace the EPROM in your transmitter, remove the case back, unplugging the RF deck and the batteries. Locate the EPROM and remove it; to do so, make a little tool out of a paper clip by straightening out one loop and bending a 90° hook on the end about 1/8" long. Now insert the hook between the IC and its socket on one end or the other. Pull up on that end until you feel the EPROM move a little. Go to the other end and repeat. Go back and forth until the device comes

out of its socket. It will take a bit of doing and you may have to have the assistance of a pair of pliers to hold your paper clip tool.

Now, remove the replacement EPROM from its carrier. Inspect the pins and make sure they are all straight and carefully straighten any bent pins with your fingernail or a pair of small needle nosed pliers. Put the replacement EPROM in place in the proper socket (the one on the top), **make sure the 1/2 moon marker on the IC is to the left!** When you are sure the device is lined up, push it all the way down into the socket.

Put the EPROM that you took out of your transmitter into the carrier that the new one came in and mail it back to Ace R/C in the protective envelope provided. If you don't return the device, we will be forced to bill you an additional charge.

Before operating the new EPROM, you **have to "SET JOYSTICKS" AND initialize it** so it can learn the unique qualities of your particular transmitter. We will describe that in the next two sections.

VII. THE "SET JOYSTICKS" ROUTINE

When the EPROM is changed, or any time a change is made to any of the stick, trim lever, auxiliary lever pots (potentiometers), or switches, the **Set Joystick** routine must be performed. For example, if you change the trim lever configuration, replace one of the pots, or make a change in a pot setting, it is required to perform this routine.

The reason for this procedure is to teach the computer the new parameters for any given pot(s) or switch(es). It is quick and simple to perform.

With the transmitter off, the **RUN/CAL** switch in the **RUN** mode, and the sticks at neutral, push the AUTO TRIM button and then turn the transmitter on. Release the AUTO TRIM button. The display will read:

SET JOY STICKS

While this is displayed, move both sticks to full up, full down, full right, and full left. Also, move all the trim levers to both extremes, the CH 6 and CH 7 levers to both extremes, and flip both the CH 5 and CH 8 switches to their extremes.

To exit this procedure, push the AUTO TRIM button once again, and the display will display the normal **RUN** mode information. The routine

is complete, but don't forget to exit properly by pushing the AUTO TRIM button.

Now, if you want to save any settings you have previously stored for a given aircraft, you need to go into the CALIBRATE SERVOS menu for each aircraft number and do the SAVE NEW VALUES routine.

VIII. INITIALIZING A NEW EPROM AND READING THE A/D CONVERTERS

If you have installed an updated EPROM, it will be necessary to perform this routine.

It is also a useful trouble-shooting tool for the technically oriented modeler because it verifies the proper operation of the sticks, switches, and levers by allowing you to view the input to the A/D (analog to digital) converters.

This routine also allows you to re-calibrate the digital voltmeter, if desired. Under normal circumstances, you should **never** have to perform this procedure because it is done at the factory. If you do want to calibrate the voltmeter, you will need a variable power supply capable of producing at least 13 volts and an accurate voltmeter.

To access this routine, you have to perform the following procedure:

1. With the transmitter OFF and with the RUN/CAL switch in the RUN position, press and hold the PRESET button. Then:

2. Turn the transmitter ON. The display will read (the number may be different):

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3. Still keeping the PRESET button depressed, push the AUTO TRIM button and hold.

4. Then, release the PRESET button.

5. Then, release the AUTO TRIM button. The display should read:

YOU SURE? Y (N)

If the display does not agree with this, try again. It may take a couple of times to get the procedure down pat. When you reach this menu level, use the aileron stick to toggle to (Y) Yes and click the option button and observe the display.

For a few moments, all 16 of the display's characters will be occupied with a letter or a number to verify proper operation. Then:

INITIALIZE Y (N)

If you have installed a new EPROM, you will need to use the aileron stick to answer (Y) Yes and click. The display will momentarily show:

EPROM INIT'D

And then go to:

VOLTMETER Y (N)

Normally, if you are just wanting to initialize a new EPROM, you are done at this point. Exit this procedure by turning the transmitter off. You can now resume normal operation.

CAUTION: DO NOT ANSWER "YES" UNLESS YOU HAVE READ THE NEXT SEVERAL PARAGRAPHS:

If the technically oriented modeler wants to go deeper in this menu, do so as follows:

If for some reason, you wish to calibrate the voltmeter, the transmitter power needs be supplied with a variable power supply monitored by a good, accurate voltmeter. Power up the transmitter with the supply set at about 10V. Answer (Y) Yes to the VOLTMETER question and click; once you do, you are committed to perform this procedure to completion. The display will prompt you to set the power supply to 12.5V. Do so, and when stable, click the option button. Now you will be prompted to set the supply at 9.5V. Do so, and when stable, click. The voltmeter is now calibrated using the constants you just supplied; you can vary the supply to verify proper operation. Click once more and you can now continue with the reading of the A/D converters.

If you have either calibrated the Voltmeter or used the aileron stick to answered (N) No to the Voltmeter question and clicked, the display will read:

ELV A/D = XXX

This is the raw A/D data for each channel's input to the computer (except CH 8). This routine is used for checking the adjustments of the control pots to make sure they don't have "dead" spots and are adjusted properly. Once you have checked a particular channel, toggle to the next one by clicking the option button. You will proceed through all channels, including the manual trim levers. Note: you can only move in one direction in this procedure; if you need to go back to a previous channel, you will need to start over at the beginning of the "Initializing" procedure.

The number displayed should be as follows: when in neutral (if we are looking at a neutralizing channel), the number should be approximately 128. At the extremes of stick or lever travel, the numbers displayed should range somewhere between 0 and 255; never should it reach 0 or 255 before the stick or lever reaches the end of travel; if it does, there will be a "dead spot" at that portion of the travel. If you have to make an adjustment of any of the pots, it will be necessary to perform the "Set Joysticks" routine.

After reading all the A/D converters for all the channels and trims, the next display will automatically read a series of 0's and 1's. This displays the status of each of your micropro switches and buttons including CH 8. When you push buttons and flip switches, you will notice the state of a particular display segment change.

You are at the end of this routine when you have reached this point. To exit, simply turn the transmitter off.

IX. RS232 INTERFACE OPTION

The RS232 Interface allows you to link your micropro to an IBM compatible PC for the purposes of storing and implementing programming between your transmitter and your PC. We also have plans to make the hardware and software available to link micropro to micropro in order to transfer programming back and forth between two transmitters. Details about this feature are not available at the time these instructions were printed but you will be informed of this feature's availability by means of the Registration Card enclosed.

X. CONCLUSION

As you progress through your **micropro** experience, we know that you will find this transmitter a useful friend, not a technological nightmare. **BUT**, we also realize that we have not anticipated all of the variations that may be useful. We know that you, the capable user of this transmitter, will come up with possibilities far beyond the vision we had when we developed the software for the **micropro**. We ask that you will let us know your requirements so we can upgrade the software as needed, plus share your thoughts and applications with other **micropro** users.

Since 1953, Ace R/C has listened; let us hear from you.

ATTENTION: The material contained in this manual, the electronic circuit, and the software contained in the **micropro 8000** are copyrighted. Copying, duplication or reproduction by any means is strictly prohibited.

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