PRO LINE Competition Series

INSTRUCTION MANUAL

March 4, 1975

PRO LINE INSTRUCTION MANUAL INSERT FOR THE COMPETITION SERIES

THE FOLLOWING ADDITIONS AND / OR CHANGES APPLY TO ALL 1975 COMPETITION SERIES SYSTEMS:

CHARGING BATTERIES WITH STANDARD CHARGER

Plug the charger into 117 VAC. 50 or 60 Hz wall outlet. Next plug the charger into the charge jack on the airborne switch harness and/or transmitter charging socket. When charging is taking place, the respective lamps should light. NOTE: There are two indicator lights for the transmitter, they must **both** light, if one fails to light this indicates a failure in either the charger or transmitter charge circuit and service is required. As a safety feature the indicator lamps will not light if the transmitter or receiver power switches are left on. Charge batteries initially for 24 hours before flying. It is highly desirable to charge just before a flying session, whether or not the set has been operated after the last full charge. The following minimum charging times are recommended to insure a full charge. (Charging for several days will not damage the cells.)

All Transmitters — 11 Hours
225 MA Battery — 16 Hours*
500 MA Battery — 11 Hours
550 MA Battery — 12 Hours
750 MA Battery — 16 Hours

*(Charge only with charger adapter)

It is recommended that the batteries be charged approximately once per month even if the system is being stored.

TRANSMITTER DUAL RATE SWITCH

A dual rate switch is located near the "on-off" switch on the 2-stick model and next to the trainer button on the single stick model. This switch reduces the servo travel in relation to control stick movement on the aileron channel. The normal position of this switch is in the reduced travel position. Set up the aileron linkage to give adequate control surface deflection for normal flying. Then when additional deflection is needed for some rolling maneuvers, move

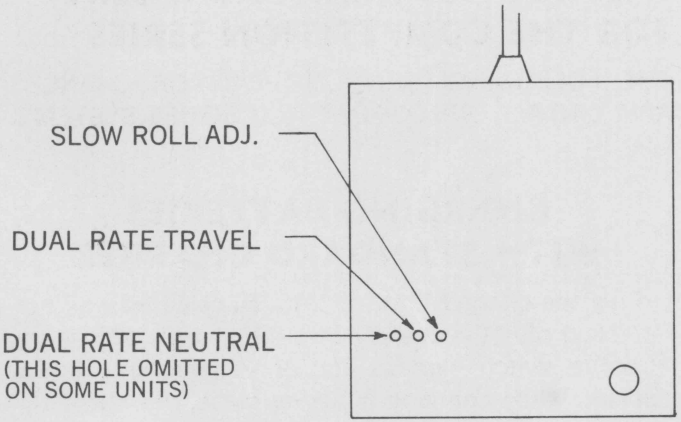
the switch to the high travel position. The amount of travel reduction is adjustable through a hole located on the rear of the transmitter case (see sketch).

There should be no shift in the aileron servo neutral position when the dual rate switch is activated. The neutral adjustment is set at the factory and will not usually need further adjustment. If the neutral shift adjustment should need re-adjusting and there is no hole provided on the rear of the case, the back cover must be removed to gain access to the trimmer control.

SLOW ROLL BUTTON

This is a push-button type switch located on the top surface of the 2-stick model and on the right side of the single stick model. When this button is pushed a pre-determined amount of aileron deflection is signaled for a uniform roll rate.

The **amount** and **direction** of roll is adjustable through a hole located on the rear of the transmitter case (see sketch). When the multiturn slow roll trim pot is set at approximately the center of its travel, there will be very little or no deflection when the button is pressed. Turning the adjusting screw clockwise will give right roll and counter-clockwise will give left roll.



PLS-1 SERVO

This is a new servo for 1975. The instructions in this manual regarding servos apply with the exception that wood servo rail spacing should be 1-17/32".

Since the introduction of the competition series early in 1969 it has been the standard of the industry. We feel the new system will contribute as much to the state of the art now, as did its predecessor in 1969.

The tight, rock solid control response, along with the ability to fly through heavy interference, noise and weak signals, will continue to set the standard for the industry.

Without reservation, we honestly believe that we market the finest digital system ever offered to the modeling public.

CHARGING BATTERIES

The transmitter and airborne batteries may be charged individually or simultaneously as follows:
STANDARD CHARGER:

Plug the charger into 117 VAC 50 to 60 C.P.S., or 12 VDC cigarette lighter jack with negative ground. (A diode is used in the 12 volt input circuit so no damage will result if the polarity is accidently reversed). For positive ground autos, transpose the wires on pin #1 and #3 of the 3-pin input plug. **Pin #1 is ground, pin #3 is positive.** Next plug the charger into the jack provided on the airborne switch harness and/or the transmitter charging jack. As a safety feature the respective indicator lamps will not light if the power switches are in the "on" position. Charge batteries initially for 24 hours before flying. The output of the built-in charger has been factory adjusted to provide a full charge in 16 hours, charging for up to 48 hours will not damage the cells.

It is desirable, when possible, to charge at least 16 hours before a flying session regardless of whether or not the set has been operated after the last full charge.

If the unit is to be stored for long periods of time, the batteries should be charged monthly to avoid deterioration.
FAST CHARGER:

Plug the charger into 117 VAC 50 to 60 CPS or 12 VDC as with standard charger above.

When fast charging at the flying field, keep the charger and battery packs in the shade, below 90 degrees temperature. Plug the charger into the jack provided on the airborne switch harness and/or the transmitter charging jack. As a safety feature the respective indicator lamp will not light if the power switches are in the "on" position. When a discharged pack is first connected, the indicator lamp will glow brightly. This indicates the unit is charging at the high rate of approximately 350 MA. As the battery nears the 70% to 80% charge point, the lamp will start to dim down (with some flashing). This indicates

the charging current is tapering down. Finally the lamp will remain dim with no flashing, indicating the unit is charging at the low current rate of 50 MA. The time it takes for the lamps to dim will vary depending on how far the batteries were discharged. Time will vary from a few minutes to a maximum of one hour. If the lamps fail to dim, this indicates a shorted power cell and the battery should be disconnected to avoid damage to the remaining cells in the pack. High impedance or low capacity cells will cause the lamps to dim sooner than normal.

The charger is of the voltage sensing type and operates on the voltage rise characteristic that occurs in ni-cad cells as they are charged. The unit is adjusted to taper down to the slow charge rate when the cells reach approximately 70% to 80% of full charge. With the threshold set at this point, there is an ample margin of safety to insure reliable operation over a wide temperature range. A thirty-minute charge will provide over thirty-minutes of flying time. When powered from the 12 volt auto input, a charge between flights equal to the total flying time will maintain a sufficient charge level to fly indefinitely. For example, if the radio was on for 15 minutes, a 15 minute charge will replace the power used. When a full charge is desired, charge for 16 hours or overnight with the two position switch in the "normal" position or for a minimum of 4 hours in the fast charge position. For best results do not use fast charge for overnight charging or when the unit is to be left unattended.

It is desirable, when possible to full charge overnight before a flying session regardless of whether or not the set has been operated after the last full charge.

If the unit is to be stored for long periods of time, the batteries should be charged monthly to avoid deterioration.

The fast charger has a voltage adjustment control inside that is factory set for the type of cells used in your system. If batteries from different production runs are to be charged, observe that the indicator lamps dim down properly within the normal one hour time. If they fail to dim down the control can be turned counter-clockwise very slowly until the lamps dim. If they dim down too soon the control can be turned clockwise. NOTE: On chargers with one control, both the transmitter and receiver outputs are adjusted simultaneously. On later models there is a separate control for each output. The control located on the same side as the airborne charge cable adjusts only that output. **DO NOT ADJUST THESE CONTROLS UNNECESSARILY!**

MAXIMUM FLYING TIMES

The added performance and increased reliability achieved through the use of integrated circuits has resulted in somewhat shorter flying times from the airborne batteries.

Because such factors as 1) tightness of electronic deadband, 2) component tolerances, 3) how the system is used in the air, 4) individual cell and battery pack difference all affect the battery, it is difficult to say exactly how long a receiver battery pack will last.

The maximum operating time of a system with 5 servos should be about 3 hours with a fully charged 750MAH battery pack in good condition, and a little over 2¼ hours with the 550MAH pack. This of course is only a guideline and the actual time will depend on the factors mentioned above. Any time you are pushing the time limit you should be very careful to observe the speed of the servos between flights and in the air. If you notice a slow down or if the plane doesn't seem to "feel" normal, land as quickly as possible and check the speed of the servos.

If longer flying times are needed we recommend fast charging between flights or changing to a fresh flight battery. The transmitter drain is lower and will normally run about 3½ hours or more per charge.

An acceptable means of determining the state of charge of a Ni-Cad battery is to measure the voltage across it under load. Pro line makes an accessory meter that can be plugged into the charge jack to check approximate state of charge between flights. This unit comes with connecting cables and instructions. Order stock #PL-B-T

EQUIPMENT INSTALLATION

Failure to install equipment properly can result in loss of performance and reliability. PLEASE READ THE FOLLOWING DIRECTIONS CAREFULLY!

SERVO INSTALLATION

PLS-3 SERVO:

We recommend that servos be mounted in molded servo mounting trays provided with the system or on ¼" x ⅜" hardwood (maple or beech motor mount stock) rails spaced exactly 1⅞" apart. A spacing guide approximately 3" long may be cut from ⅛" sheet balsa and is helpful in maintaining proper spacing and alignment of the servo rails to permit at least 1/16" clearance between servos, fuselage sides, top and bottom, etc. After the rails have been securely mounted, position servos and mark the location of the mounting screw holes and the clearance notch for the servo plug wiring. With a small rat tail file, notch one rail approximately ⅛" deep to allow clearance for servo plug wiring. THE SERVO MOUNTING HOLES MUST BE DRILLED ACCURATELY OR THE SERVO MOUNTING TABS MAY BE DAMAGED! Drill 1/16" holes and mount with No. 4 sheet metal screws. The mounting screws should be tightened until the screw head contacts the grommet, and then tightened ¼ turn more. This provides proper servo vibration and shock

protection. DO NOT OVERTIGHTEN MOUNTING SCREWS.

PLS-12 SERVO:
Install similar to PLS-3 servo above except rail spacing is 1 9/16" apart.

PLS-11 SERVO
Install similar to PLS-3 servo except rail spacing is 2⅛" apart. The wires enter from the bottom of the servo so the rails are not notched.

PLS-14 SERVO:
Install similar to PLS-3 servo except rail spacing is 1 25/32" apart.

PLS-15 SERVO:
Install similar to PLS-3 servo except rail spacing is 1 ⅞" apart.

NOTE: All servos supplied travel in the same direction. This way there is not a mixup when exchanging servos, and one spare servo is a spare for all channel positions. If you require one of opposite travel send servo and check or money order for $2.00 to factory for conversion.

BATTERY INSTALLATION

The flight battery pack may be damaged internally if subjected to excessive vibration or shock. Wrap battery case in a plastic bag to protect against fuel damage. A minimum ½" of foam rubber on all sides should be provided for protection. Usually it is desirable to mount the battery pack in the fuel tank compartment underneath the tank.

SWITCH HARNESS INSTALLATION

To provide protection from fuel and oil, mount the switch on the side of the fuselage opposite the engine exhaust. A special feature of the switch harness is the charging jack, that is used for charging the flight battery. It is normally mounted through the fuselage side for charging without disrupting the installation. When charging batteries, be sure switch is off.

RECEIVER INSTALLATION

To obtain the maximum performance that was designed and built into your radio system it is absolutely essential that the receiver and its associated wiring be mounted exactly as follows:

1. To protect the receiver from engine vibration wrap VERY LOOSELY in a minimum of ½" thick soft foam rubber or foam plastic. If extra shock protection is desired, a sheet of ¼" thick shock protecting foam pad may be wrapped over the receiver followed with the ½" foam rubber. Be careful not to compress the foam rubber by wrapping too tightly. THE RECEIVER MUST BE PACKED LOOSE: DO NOT OMIT THE SOFT FOAM RUBBER!

2. The receiver antenna must be kept as far as possible from all other wiring, including servos, switch harness, battery pack, metal push rods, etc. In most installations this can be accomplished by running the antenna forward 1" to 2" from the receiver, then straight through the top or side of the fuselage canopy and back to the tip of the fin. Tie a knot for train relief in the antenna wire to allow a little slack between the receiver and the exit point through the fuselage. A 1" to 2" piece of small tubing should be slipped over the antenna wire where it exits the fuselage to prevent the wire from becoming damaged from fatigue. The primary concern is to keep the antenna as far as possible from the rest of the installation. The antenna should be tied at the end of a rubber band to provide slight tension and take up slack to prevent damage.

NOTE: System range will be decreased noticeably on 27MHz if the antenna wire is routed too close to any other wiring.

IMPORTANT: Do not shorten the antenna or fold it back along its length. (This would de-tune the antenna circuit.) If necessary tie it at an appropriate point along its length and let it trail aft, or tie the remaining length to the stabilizer tip making an "L" shape configuration.

The connector plugs are marked to identify the various channels as follows:

AIL — aileron

CH2 — elevator

RUD — rudder

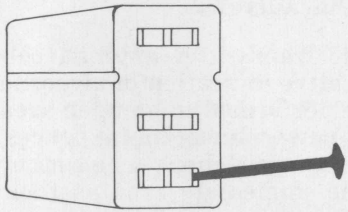
CH4 — engine

AUX 1 — auxiliary 1 — RET on 5 channel

AUX 2 — auxiliary 2 — (7 channel system only)

RET — retract channel (7 channel system only)

Route the plug wiring neatly aft (away from antenna wire), and wrap in foam rubber. Wedge the foam rubber wrapped plugs in place underneath or in front of the servos. Protect all plugs from dirt and oil.



The 3-pin connectors should fit tightly; if they should become loose, they can be tightened by wedging a pin between the plastic body and contact per the sketch.

THE AIRCRAFT

Excessive electrical noise generated by metal connections which make and break contact in rhythm with engine vibrations may reduce the useable range of the system. It is suggested that adjustable nylon clevices be used on push rod ends, at the connection of the engine throttle arm to the throttle push rod,

and at the nose gear steering arm. It a switch is used to energize electric brakes, it should be bypassed as close as possible to the switch contacts with a .01 to .15 MF disc capacitor with sort leads.

Control surfaces must move easily yet be free from excessive play or flexing. Control rod flexing, whipping, or play are the major causes behind servo gear stripping and make it impossible to realize the inherent resolution and centering of the system.

PRE FLIGHT CHECK

Be sure batteries have been freshly charged. Check all control surfaces to see they move in the proper direction related to the transmitter controls. Be especially careful with the ailerons.

A range check with the transmitter antenna collapsed will give a good relative indication of airborne range. This check must be performed in an open area clear of all obstructions, power lines, metal fences, buildings, etc. Do not attempt this check when other transmitters are on in the immediate area as their strong signals will interfere.

Proceed as follows: Position the airplane so the antenna is at a right hand angle to you. Then with the transmitter antenna pulled out so 1¼" is protruding past edge of mount, and while operating an easily visible control surface such as elevator, slowly back away from your airplane. Hold the transmitter about one foot in front of you, point the antenna at the airplane. The minimum range should be as follows:

27MHz — 15 paces (approximately 45 feet)

6 meter — 20 paces (approximately 60 feet)

72MHz — 20 paces (approximately 60 feet)

The range attained in this check may vary considerably depending on the type of surface the aircraft is sitting on, the angle and height above ground of the receiver antenna, and the presence of strong radio signals. Do not attempt flying if at least 12 paces are not attained. Re-check your installation and reposition wiring until the minimum ranges are obtained. Repeat the above tests with your engine running through its entire speed range. If range decreases considerably, some part of your mechanical system may be causing excessive electrical noise. Get to know what your antenna off range normally is. If it drops for no apparent reason, this can be a warning signal that something needs attention.

TRANSMITTER

The RF indicator meter provides a relative indication of transmitter output. It does not, however, give an accurate indication and is not a basis of comparing performance between transmitters. The initial reading should be noted with the antenna extended. if this reading changes substantially in the future it may indicate a drop off in the transmitter output. Normal meter reading varies from .6 to full scale.

The antenna electronically disconnects and collapses inside the case for storage. To extend, pull it out and turn counter-clockwise until it locks. WARNING: Failure to lock the antenna will cause very low transmitter output and probable in-flight failure due to lack of range. To retract, turn clockwise 2 turns and collapse into case.

On open gimbal models the trim friction is adjustable by turning the outer nut on the trim pot. Do not adjust too tight or the shaft will lock up.

The transmitter will stay much cleaner if you wax it frequently with a spray wax similar to Johnsons Lemon Pledge.

NOTE: On 2-stick open gimbal transmitters **with T-L mode,** the elevator and throttle trims are cross placed. This enables the user to adjust elevator trim with the left hand without removing the right hand from the control stick.

FLYING HINTS

Be careful not to press the trainer switch accidentally while flying, as this will cause complete loss of control. Get in the habit of holding the transmitter so your fingers do not rest too near the button.

The transmitter antenna radiation pattern is such that the power output from the antenna tip is extremely low. Under interference free conditions, the system has enough extra range to operate perfectly with antenna pointed at the plane, but under these conditions the receiver's automatic gain control circuit must turn up the gain of the receiver extremely high. At this time it is possible for a strong interfering signal to cause a reduction in range. For this reason, it is good practice to get into the habit of not pointing the antenna at the aircraft.

CHANGING STICK MODES

(not applicable to single stick models)

A transmitter stick mode may be changed if desired by the purchaser. This is accomplished as follows:

2-STICK OPEN MODEL

1. Remove the four screws holding the back cover and carefully slip it off. Keep these screws separated with the rear cover.
2. Remove the screw holding the throttle detent spring and remove the detent spring.
3. On the opposite gimbal remove the screw holding the elevator centering arm and remove arm.
4. The throttle detent spring and elevator centering arm should now be transposed with each other and re-installed.
5. Install the rear cover. NOTE: Whenever the transmitter mode is reversed, the elevator and throttle sockets will be reversed with each other from the previous mode, and the transmitter will no longer be compatible with others on the trainer system.

To remain compatible, the conversion must be done at the factory where the wiring can be changed.

TRAINER SWITCH

All systems incorporate training system as standard. All that is required to use this function is to conect the optional trainer cord between two transmitters. The blue connector goes to the master unit. This automatically turns off the transmitter carrier on the trainee unit and sets up the other as the master. The antenna should be collapsed from the trainee transmitter and both transmitters turned on.

The instructor has control until he presses the button transferring control to the trainee. When the instructor releases the button, he assumes control. Transmitters need not be on the same frequency. 5 and 7-channel systems will work together if channels #6 and #7 are not used. All open gimbal transmitters may be used together regardless of modes.

SERVO

No maintenance or adjustments are required. In case of trouble, return to the factory for service. The servo should not be opened as electronic packaging is extremely tight and tampering can cause failure.

NOTE: Because of the near absence of deadband, the servos will sometimes buzz with no signal being sent from the transmitter. This buzzing is no cause for concern **unless** a servo buzzes constantly. Intermittent buzzing will not cause excessive current drain.

CHANGING FREQUENCY

The transmitter and receiver "RF" sections are packaged on plug-in mini-circuit boards that can be replaced in about five minutes. When frequency change is desired, a pretuned matched set of "RF" boards can be plugged in for operation on any frequency in the 27MHz, 53MHz or 72 MHz bands. A new matched pair of circuit boards is available from your dealer for $89.90. To install, remove the transmitter and receiver covers and observe how the wires are routed to the connector plugs. Remove the screws holding the circuit boards and unplug the connectors. Plug in the new boards and re-install making sure you use the proper screws. (If longer screws are used some parts may be damaged on the P.C. Boards.)

If the purchaser wishes the frequency changed on his existing "RF" Boards, the boards or complete transmitter and receiver should be returned to the factory. Charges are as follows: Change to new frequency in the same band $20.00. Change to new frequency in different band $40.00. Please include your check or money order. Pack carefully to avoid damage. Charges include complete realignment and thorough operational checkout.

REPAIR SERVICE

Your Competition Series system has been designed to provide reliable, trouble-free operation for a long period of time when it has been properly installed. It incorporates unprecedented circuit protection against failure caused by abnormal operation. Despite these precautions, service may sometimes be

needed. To aid our repair department in giving you the best possible service, please follow these step by step instructions:

1. Except for problems confined to individual servos, or the plug-in mini-circuit boards, return complete systems even if you suspect only part is at fault. Transmitter, control sticks, and charger need not be returned unless damaged.

2. Completely separate the system from your installation. Do not send the receiver taped in foam, servos mounted in trays, etc.

3. If modifications have been made which interfere with factory checkout procedures, such changes will be returned to factory standards at your expense.

4. Charge batteries for 24 hours prior to shipment. This not only expedites repair, but provides us with a good check on the condition of your battery packs.

5. Disconnect the receiver battery packs and be sure to tape the transmitter switch in the "off" position to prevent the possibility of it being turned on in shipment.

6. Label each servo as to its control function, carefully pack all components individually with sufficient packing material to avoid shipping damage.

7. Write a brief but thorough explanation of difficulties encountered and service required. If pertinent include weather conditions. Enclose in an envelope and tape it to the back of your transmitter. We are at your service to discuss problems by telephone, but a written description should always be included with repairs.

8. Include an accurate packing list of all items returned.

9. Be sure to include your full return address and zip code inside the box as well as outside.

10. All repairs will be sent airmail unless otherwise specified.

11. Repair charges, return postage, and insurance are billed C.O.D.

WARRANTY

PRO LINE ELECTRONICS, INC. guarantees all systems to be free from defective material and workmanship for a period of 90 days from date of purchase, and agrees to remedy any such defect or to furnish a new or equal part in exchange.

This warranty does not apply if in our opinion the set was subjected to misuse, service other than normal, damage in transit, or damage caused by possible equipment failure. Any evidence of tampering with or modifications to any part of this system voids all warranties.

PRO LINE ELECTRONICS, INC. shall not be liable for any consequential or special damages caused by any defect in material and workmanship other than the liability to repair or to furnish a new or equal part in exchange.

The warranty does not include responsibility for any transportation charges.

Please completely fill out the enclosed warranty card and mail within 15 days of date of purchase to validate your warranty.

FCC LICENSE

It is illegal to operate this transmitter without the appropriate FCC license. Application forms for licensing are usually available from your dealer or the nearest office of the Federal Communications Commission.

CONCLUSION

We appreciate your confidence in our equipment. Please feel free to call on us at any time service or adjustment is needed. Your complete satisfaction and good will is our most important asset.

PRO LINE ELECTRONICS, INC.

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