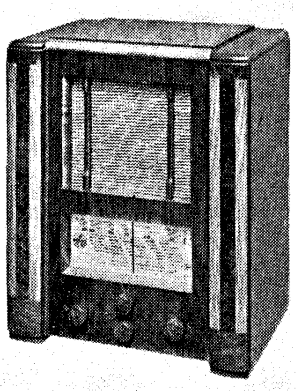
"TRADER" SERVICE SHEET

# 360

# PILOT 53, C53 AND RG53



The Pilot 53 table model.

COVERING a short-wave range of 16·5-52 m, the Pilot 53 is a 4-valve (plus rectifier) AC 3-band superhet suitable for mains of 200-250 V, 50 C/S. It has provision for both a gramophone pick-up and an extension speaker.

An identical chassis is fitted in the C53 console receiver, and the chassis of the RG53 radiogram is very similar, the differences being explained under "RG53 Modifications." This *Service Sheet* was prepared on a 53.

## CIRCUIT DESCRIPTION

Aerial input via coupling coils **L1** (SW), **L2** (MW) and **L3** (LW) to single-tuned circuits **L4, C20** (SW), **L5 C20** (MW) and **L6, C20** (LW) which precede triode hexode valve (**V1, Osram X65**) operating as frequency changer with internal coupling.

Triode oscillator grid coils **L7** (SW), **L8** (MW) and **L9** (LW) are tuned by **C21**; parallel trimming by **C22** (SW), **C23** (MW) and **C24** (LW); series tracking by **C4** (SW), **C25** (MW) and **C26** (LW). Reaction is applied from anode by coils **L10** (SW) via stabilising resistance **R2, L11** (MW) via stabilising resistance **R3** and **L12** (LW) via stabilising resistance **R4.**

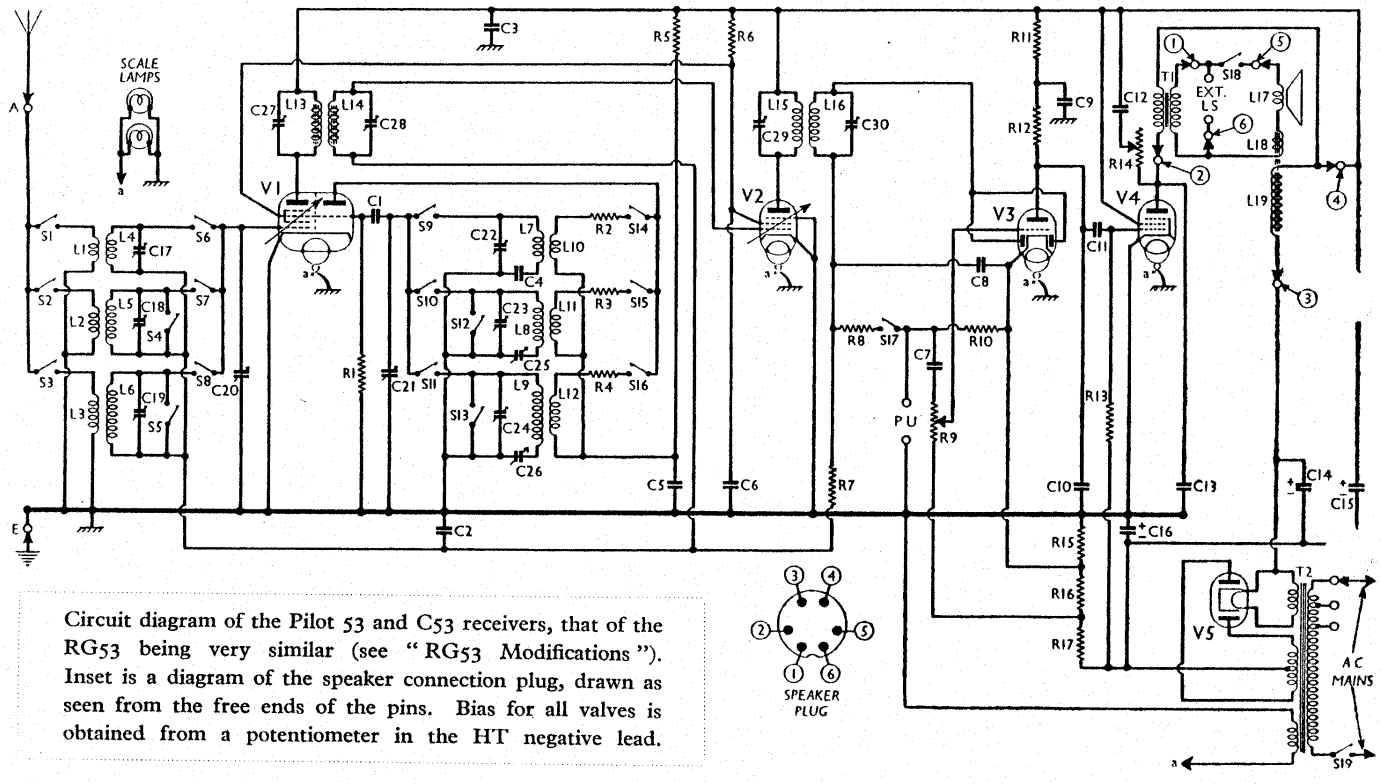
Second valve (**V2, Brimar 6U7G**) is a variable-mu radio frequency pentode operating as intermediate frequency amplifier with tuned-primary tuned-secondary transformer couplings **C27, L13, L14, C28** and **C29, L15, L16, C30; L13** and **L14** being iron-cored while **L15** and **L16** are air-cored.

**Intermediate frequency 451KC/S.**

Diode second detector is part of double diode triode valve (**V3, Brimar 6Q7G**) with both diode anodes strapped together to operate as a single diode. Audio frequency component in rectified output is developed across load resistance **R10** and passed via AF coupling condenser **C7** and manual volume control **R9** to CG of triode section, which operates as audio frequency amplifier. IF filtering by resistance **R8** in diode load circuit and condensers **C8,** in diode circuit, and **C10** in triode anode circuit. Two sockets are provided for connection of gramophone pick-up via a special plug which, when inserted and turned through a few degrees in an anti-clockwise direction, automatically causes **S17** to open, breaking the junction of **R8** and **R10** and muting radio. The pick-up is then in circuit directly between the junction of **C7, R10** and chassis, a is represented in our diagram by two sock

The potential developed across **R8** and **R10** in series is fed back through the decoupling components **R7** and **C2** to FC, on all bands, and IF valves, giving automatic volume control. No delay voltage is employed but **V1** and **V2** obtain their fixed minimum GB potential via the AVC line as, while with no signal applied to **V3** diodes no diode current flows, the load resistances are returned to the cathode which is biased negatively with respect to chassis, to which **V1** and **V2** cathodes are returned, and in this condition the potential all the way along the AVC line will be that at **V3** cathode, diode load potentials being added to it in the same direction, or sign, when a signal is applied to the diode.

Resistance-capacity coupling by **R12, C11** and **R13** between **V3** triode and pentode output valve (**V4, Brimar 6F6G**). Fixed tone control in anode circuit by **C13** while variable tone control is provided by RC filter **C12, R14** also in anode circuit. Provision is made for




Circuit diagram of the Pilot 53 and C53 receivers, that of the RG53 being very similar (see "RG53 Modifications"). Inset is a diagram of the speaker connection plug, drawn as seen from the free ends of the pins. Bias for all valves is obtained from a potentiometer in the HT negative lead.

nnection of a low impedance external eaker by means of a switched two-pin cket and plug similar to that used for nnecting the gramophone pick-up. In is case a small anti-clockwise movement the plug opens switch **S18** thus breaking e internal speaker speech coil circuit for ng purposes. If the plug is not turned, speakers will be in circuit, the external e being connected across the secondary of e internal speaker transformer **T1.**

HT current is supplied by IHC full-wave ctifying valve (**V5, Brimar 5Z4G**). Smooth- g by speaker field **L19** and electrolytic ndensers **C14, C15.** HT circuit RF filtering **C3.**

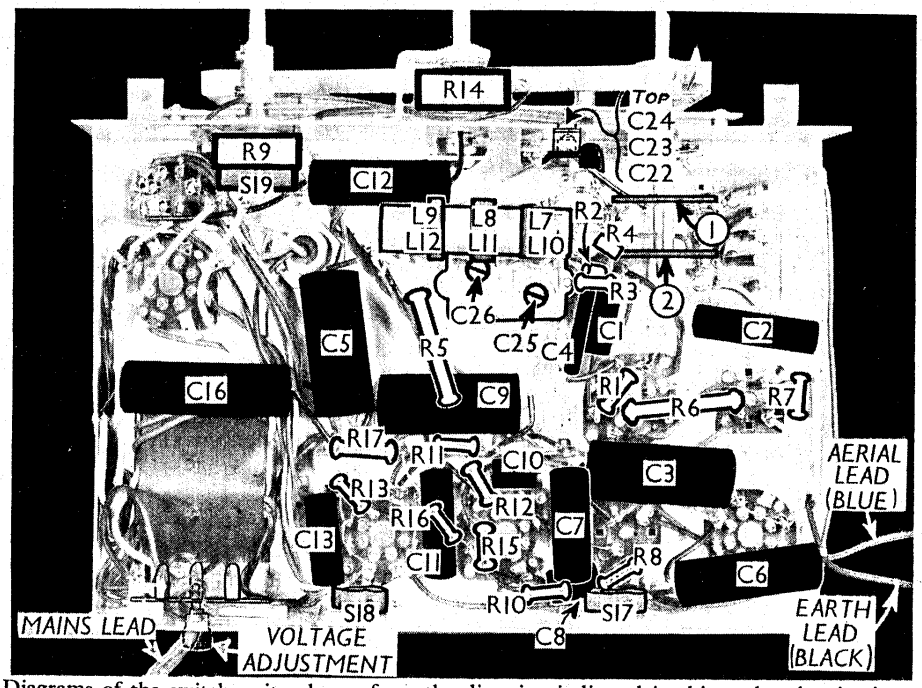
GB potentials for **V1, V2, V3** triode and are obtained automatically from drop ng resistances **R15, R16** and **R17** forming otential divider in the negative HT to is. It should be noted that the common ative lead of **C14** and **C15** is returned to negative at the centre tap of the HT ding of the mains transformer **T1,** not chassis.

## COMPONENTS AND VALUES

| | RESISTANCES | Values (ohms) |
|---|---|---|
| 1 | V1 osc. CG resistance | 100,000 |
| 2 | Osc. SW reaction stabiliser | 200 |
| 3 | Osc. MW reaction stabiliser | 2,000 |
| 4 | Osc. LW reaction stabiliser | 20,000 |
| 5 | V1 osc. anode HT feed | 30,000 |
| 6 | V1, V2 SG's HT feed | 30,000 |
| 7 | AVC line decoupling | 1,000,000 |
| 8 | IF stopper | 50,000 |
| 9 | Manual volume control | 750,000 |
| 10 | V3 diodes load resistance | 300,000 |
| 11 | V3 triode anode decoupling | 100,000 |
| 12 | V3 triode anode load | 200,000 |
| 13 | V4 CG resistance | 500,000 |
| 14 | Variable tone control | 100,000 |
| 15 | Auto bias pot. divider for V1, V2 | 70 |
| 16 | fixed GB ; V3 triode and V4 | 30 |
| 17 | GB | 190 |

| | CONDENSERS | Values (μF) |
|---|---|---|
| | V1 osc. CG condenser | 0·0001 |
| | AVC line decoupling | 0·05 |
| | HT circuit RF by-pass | 0·1 |
| | Osc. circuit SW tracker | 0·006 |
| | V1 osc. anode decoupling | 0·1 |
| | V1, V2 SG's decoupling | 0·05 |
| | AF coupling to V3 triode | 0·05 |
| | IF by-pass | 0·00015 |
| | V3 triode anode decoupling | 0·1 |
| 0 | IF by-pass | 0·00015 |
| 1 | V3 triode to V4 AF coupling | 0·01 |
| 2 | Part of variable tone control | 0·05 |
| 3 | Fixed tone corrector | 0·005 |
| 4* | HT smoothing | 8·0 |
| 5* | | 8·0 |
| 6* | Auto GB circuit by-pass | 50·0 |
| 7‡ | Aerial circuit SW trimmer | — |
| 8‡ | Aerial circuit MW trimmer | — |
| 9‡ | Aerial circuit LW trimmer | — |
| 0‡ | Aerial circuit tuning | — |
| † | Oscillator circuit tuning | — |
| 2‡ | Osc. circuit SW trimmer | — |
| 3‡ | Osc. circuit MW trimmer | — |
| 4‡ | Osc. circuit LW trimmer | — |
| 5‡ | Osc. circuit MW tracker | 0·0006 |
| 6‡ | Osc. circuit LW tracker | 0·0002 |
| 7‡ | 1st IF trans. pri. tuning | — |
| 8‡ | 1st IF trans. sec. tuning | — |
| 9‡ | 2nd IF trans. pri. tuning | — |
| 0‡ | 2nd IF trans. sec. tuning | — |

* Electrolytic. † Variable. ‡ Pre-set.




Diagrams of the switch units, drawn from the direction indicated in this under-chassis view, are given on the back of this sheet.

| | OTHER COMPONENTS | | Approx. Values (ohms) |
|---|---|---|---|
| L1 | Aerial SW coupling coil | | 0·6 |
| L2 | Aerial MW coupling coil | | 20·0 |
| L3 | Aerial LW coupling coil | | 120·0 |
| L4 | Aerial SW tuning coil | | 0·05 |
| L5 | Aerial MW tuning coil | | 3·5 |
| L6 | Aerial LW tuning coil | | 19·0 |
| L7 | Osc. circuit SW tuning coil | | 0·1 |
| L8 | Osc. circuit MW tuning coil | | 6·4 |
| L9 | Osc. circuit LW tuning coil | | 9·6 |
| L10 | Oscillator SW reaction | | 0·8 |
| L11 | Oscillator MW reaction | | 1·8 |
| L12 | Oscillator LW reaction | | 5·8 |
| L13 | 1st IF trans. | Pri. | 7·0 |
| L14 | | Sec. | 7·0 |
| L15 | 2nd IF trans. | Pri. | 11·25 |
| L16 | | Sec. | 11·25 |
| L17 | Speaker speech coil | | 3·0 |
| L18 | Hum neutralising coil | | 0·2 |
| L19 | Speaker field coil | | 1,500·0 |
| T1 | Speaker input trans. | Pri | 700·0 |
| | | Sec. | 0·5 |
| T2 | Mains trans. | Pri., total | 35·0 |
| | | Heater sec. | 0·1 |
| | | Rect. heat. sec. | 0·15 |
| | | HT sec., total | 310·0 |
| S1-S16 | Waveband switches | | — |
| S17 | Radio muting switch | | — |
| S18 | Speaker switch | | — |
| S19 | Mains switch, ganged R9 | | — |

## DISMANTLING THE SET

**Removing Chassis.**—If it is desired to remove the chassis from the cabinet, remove the four control knobs (pull off) and the four bolts (with washers and spring washers) holding the chassis to the bottom of the cabinet. Now free the speaker leads from the staple at the side of the cabinet, when the chassis can be withdrawn to the extent of the speaker leads, which is sufficient for normal purposes.

*When replacing,* do not forget to place the felt washers on the control spindles before fixing the knobs.

To free the chassis entirely, unplug the speaker leads from the socket on the chassis deck.

**Removing Speaker.**—The speaker can be removed from the cabinet by unplugging the leads from the socket on the chassis deck, removing two of the clamps (nuts and lock washers) and slackening the other two. *When replacing,* see that the transformer is on the right.

## VALVE ANALYSIS

| Valve | Anode Voltage (V) | Anode Current (mA) | Screen Voltage (V) | Screen Current (mA) |
|---|---|---|---|---|
| V1 X65 | 258 | 1·2 | 110 | 3·1 |
| | Oscillator | | | |
| | 70 | 4·5 | | |
| V2 6U7G | 258 | 6·8 | 110 | 1·6 |
| V3 6Q7G | 70 | 2·7 | — | — |
| V4 6F6G | 233 | 35·0 | 258 | 6·4 |
| V5 5Z4G | 322† | — | — | — |

† Each anode, AC.

Valve voltages and currents given in the table above are those measured in our receiver when it was operating on mains of 230 V, using the 225 V tapping on the mains transformer. The receiver was tuned to the lowest wavelength on the medium band, and the volume control was at maximum, but there was no signal input as the aerial and earth leads were shorted.

Voltages were measured on the 400 V scale of a model 7 Universal Avometer, chassis being negative.

If, as in our case, **V2** should become unstable when its anode and screen currents are being measured, it can be stabilised by connecting a non-inductive condenser of about 0·1 μF from grid (top cap) to chassis.

## GENERAL NOTES

**Switches.—S1-S16** are the waveband switches, in two rotary units beneath the chassis. These are indicated in the under-chassis view, and shown in detail in the

diagrams on this side of this sheet, where they are as seen looking from the rear of the underside of the chassis. The table in col. two gives the switch positions for the three control settings, starting from fully anti-clockwise. A dash indicates open, and **C** closed.

**S17** is the radio-gram switch, of the rotary type, associated with the pick-up sockets at the rear of the chassis. **S17** is normally closed, but when the 2-pin pick-up plug is inserted and rotated anti-clockwise, it opens **S17** and so mutes radio by breaking the input to the grid circuit of **V3.** When the pick-up plug is rotated clockwise, however, **S17** closes for radio operation.

**S18** is a similar switch associated with the external speaker sockets, also at the rear of the chassis. When an external speaker is plugged in, and the 2-pin plug is rotated anti-clockwise, **S18** opens and mutes the internal speaker by disconnecting its speech coil circuit. In the clockwise position, however, **S18** is closed, and both speakers are in operation.

**S19** is the QMB mains switch, ganged with the volume control **R9.**

**Coils.—L1-L6,** and the IF transformers **L13, L14** and **L15, L16,** are in three screened units on the chassis deck, with their associated trimmers. Note that the trimmers **C17-C19** are reached through three holes in the front of the **L1-L6** can.

**L7-L12** are on an unscreened tubular former beneath the chassis.

**Scale Lamps.**—These are two Ever Ready miniature bayonet cap types, rated at 7·3 V, 0·25 A.

**Condensers C14, C15.**—These are two 8$\mu$F 475PV electrolytics in a single tubular metal case, mounted on the chassis deck. The case is isolated, and the black lead is the common negative. Note that it does not go to chassis. The red lead to **V5** valve-holder is the positive of **C14,** and the red lead to the speaker socket the positive of **C15.**

## TABLE AND DIAGRAMS OF THE SWITCH UNITS

| Switch | LW | MW | SW |
|---|---|---|---|
| S1 | — | — | C |
| S2 | — | C | — |
| S3 | C | — | — |
| S4 | — | — | C |
| S5 | — | C | C |
| S6 | — | — | C |
| S7 | — | C | — |
| S8 | C | — | — |
| S9 | — | — | C |
| S10 | — | C | — |
| S11 | C | — | — |
| S12 | — | — | C |
| S13 | — | C | C |
| S14 | — | — | C |
| S15 | — | C | — |
| S16 | C | — | — |

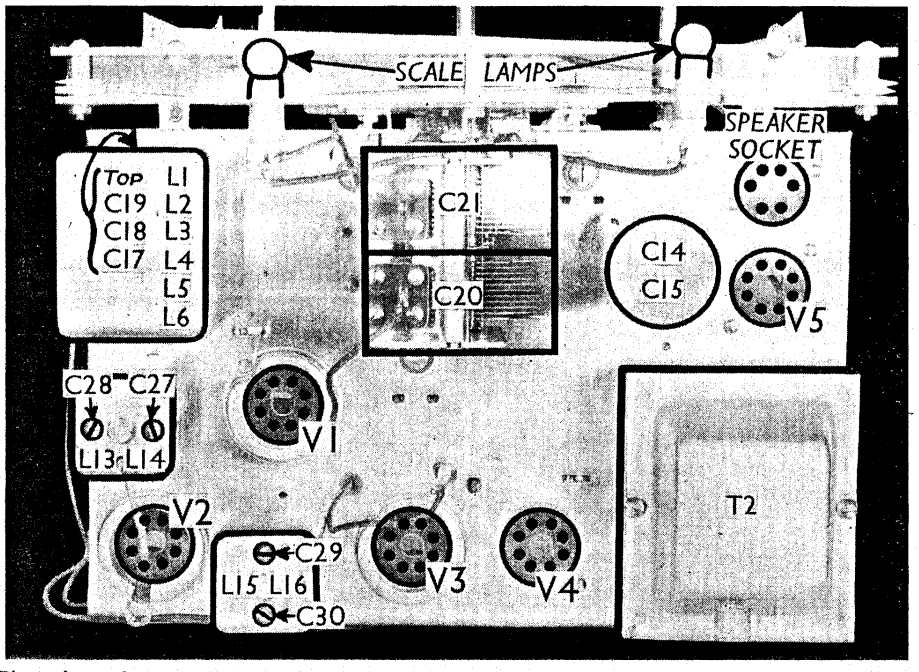
**Condenser C16.**—Note that the *positive* connection of this 50 $\mu$F electrolytic goes to chassis.

**Speaker Plug and Socket.**—The speaker is connected to the receiver by means of a 6-pin plug and socket, a diagram of the plug, looking at the free ends of its pins, being given beneath the circuit diagram. The plug and socket connections, numbered to agree with this diagram, are indicated by circles and arrows in the circuit.

The colour coding of the connections to the pins of the plug is as follows: 1, red/white; 2, blue; 3, red; 4, yellow; 5, black; 6, white.

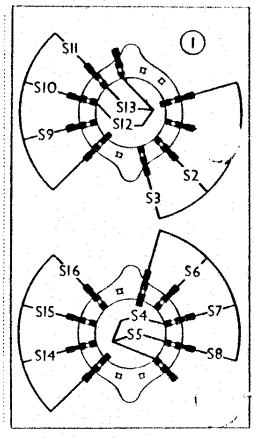
At their opposite ends the coloured leads are connected to the speaker transformer terminal strip. Looking at the back of the speaker with the transformer on the right (as it is in the receiver), and numbering the connecting tags from top to bottom, the coding is: 1, yellow; 2, black; 3, red/white; 4, white; 5, blue; 6, red.

**Pre-Set Condensers.**—Apart from those included in the coil units on the chassis deck, there are three trimmers beneath the chassis (**C22-C24**), adjustable through holes in the front of the chassis, and two trackers (**C25, C26**) in a double unit, also beneath the chassis.




Plan view of the chassis. Three trimmers are incorporated in the **L1-L6** coil unit and are indicated as seen when reading from top to bottom.

Diagrams of the switch units drawn as seen when looking in the direction of the arrows in the under-chassis view. A table giving the switch positions for the three control settings is on the left.




**Chassis Divergencies.**—The speaker plug and socket connections described above differ somewhat from those in the makers' diagram.

The connections of **R14** and **C12** are reversed in the makers' diagram, **R14** being on the HT line side of **C12.**

The makers show **C10** returned to the cathode of **V3,** but in our model it goes to chassis.

## RG53 MODIFICATION

The only difference in the radiogram model RG53 (apart from the addition of a gramophone motor, the use of a larger speaker, etc.), is that the special combined switch (**S17**) and pick-up sockets unit at the rear of the chassis is replaced by a single-pole double-throw switch mounted on the motor board for radio-gram switching.

## CIRCUIT ALIGNMENT

**IF Stages.**—Switch set to MW, and turn gang condenser to maximum. Connect signal generator via a 0·1 $\mu$F condenser to control grid (top cap) of **V2,** and chassis.

Feed in a 451 KC/S signal, and adjust **C30,** then **C29,** for maximum output. Transfer signal generator to control grid (top cap) of **V1,** and adjust **C28,** then **C27,** for maximum output. Re-check all settings with the signal generator connected to **V1.**

**RF and Oscillator Stages.**—With gang condenser at maximum, pointer should cover the short vertical line at the top right-hand corner of the tuning scale. Connect signal generator to **A** and **E** leads via a 0·0002 mF condenser.

**MW.**—Switch set to MW, and tune to 200 m on scale. Feed in a 200 m (1,500 KC/S) signal, and adjust **C23,** then **C18,** for maximum output. Feed in a 500 m (600 KC/S) signal, tune it in, and adjust **C25** for maximum output, while rocking the gang for optimum results. Repeat the 200 m adjustments.

**LW.**—Switch set to LW, and tune to 800 m on scale. Feed in an 800 m (375 KC/S) signal, and adjust **C24,** then **C19,** for maximum output. Feed in a 2,000 m (150 KC/S) signal, tune it in, and adjust **C26** for maximum output, while rocking the gang for optimum results. Repeat the 800 m adjustments.

**SW.**—Switch set to SW, and tune to 17 m on scale. Feed in a 17 m (17·65 MC/S) signal, and adjust **C22,** then **C17,** for maximum output. Repeat these adjustments very accurately. There is no variable SW tracker to be adjusted.