

SUBSCRIBER LINES

APPLICATION OF THE J94024 LOOP CHECKING SYSTEM

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1. GENERAL

1.01 This section describes suggested procedures for utilizing the J94024 Loop Checking System to locate substandard conditions in the loop plant.

1.02 The Loop Checking System has been designed to check transmission design and use of subscriber loops served out of Step-by-Step, #1 Crossbar, and #5 Crossbar offices having nominal 48V talking-battery supply.

1.03 Lines equipped with Dial Impulse Repeaters (DIR) or Dial Long Line sets (DLL) cannot be checked with the normal loop checking procedure. Similarly, lines composed of cable and open wire may not always check properly with normal loop check procedure. Special applications will be covered in other sections of the B.S.P.'s.

1.04 A survey procedure is recommended for periodic application of the Loop Checking System in each central office area. This will provide a quick way to locate the bulk of substandard conditions.

1.05 Surveys should be repeated at two to three year intervals, depending on the amount of outside plant activity in each central office area. Between surveys, loop checks should be made on all poor transmission report visits. Loop checks might also be made on other repair visits or on installation visits. This application of the Loop Checking System should be decided locally.

1.06 The output level of the Loop Checker Generator should be accurately adjusted before the start of a survey and should be checked at least once a week during the survey.

1.07 Loop length should be obtained from a map of the central office area. Such a map may be prepared as described in B.S.P. Section AB22.090.3, AG15.212.

1.08 The results of a loop check should be indicated on the standard Loop Check Ticket, Form E-4948.

2. PROCEDURES

2.01 *Survey*

2.011 Select one working pair in each 25-pair subscriber cable complement terminated on the main frame. Select the twelfth pair* in the complement. The pair selected must be one serving an exchange main station. The first time a party line is selected, use the station farthest from the central office. The next time a party line is selected, use the station nearest the central office. Alternate in this manner on subsequent selections of stations on party lines. This method should be used to the extent that the distance from the central office can be readily estimated from the terminal locations shown on the cable records. Do not select pairs used for foreign exchange lines or lines equipped with DLL's or other auxiliary equipment.

* If the twelfth pair in the complement does not meet the above conditions, or is spare, select, in this order, the next higher pair (13th), then the next lower (11th), etc, alternating between the next higher and lower pairs within the 25-pair complement until a pair is found that can be used.

Note the cable, pair, and telephone number for each pair selected on separate loop check tickets.

2.012 The customer's name and address, obtained from the line cards, should be entered on each loop check ticket.

2.013 Loop check tickets should be divided into the same number of groups (in accordance with geographical areas) as the number of people making the field visits. The tickets for a particular area can then be given to one person which will tend to reduce travel time between loop checks.

2.014 The person making the loop checks should make the check from the customer's location, either at the telephone set connector block, or at the protector. If the drop is readily available outside the premises, this is also a satisfactory location from which to check. Last choice should be the cable terminal.

2.015 B.S.P. Section C17.202 describes the method of making a loop check. In general, the procedure is as follows. At the customer location, connect the 24A LINE terminals to the line to be checked, and connect the 1011 Handset (in MON condition) to the TEL terminals. Set the 24A LENGTH dial to the proper loop length as obtained from the map provided for this purpose. Operate the 1011 Handset switch to the TALK position. After hearing dial tone, dial the line number associated with the 24B Loop Checker Generator in the central office. Once the sweeping tone is heard, depress the ZERO SET button and adjust the ZERO SET dial until the meter reads zero. Release the ZERO SET button and depress the MEAS button. Observe the meter needle during at least one complete sweep of the 24B generator. The needle should stay in the green portion of the meter scale for the entire sweep. If it enters the yellow portion at any point in the sweep, the loop is considered to be substandard. To verify the reading, the test line should be released and the loop check should be repeated. The extent of the needle swing should be marked on the loop check ticket as described in B.S.P. Section C17.202, for both initial and recheck.

2.016 At the end of each day of the survey, the completed loop check tickets should be returned to the Plant Service Center for analysis.

3. HANDLING OF "YELLOW" TICKETS

3.01 The loop check tickets returned for analysis should be sorted. The only tickets requiring further work are the ones which show a yellow reading.

3.02 All tickets which show a yellow reading should be turned over to the Assignment Center for processing. The Assignment Center will supply the information requested on each loop check ticket concerning CO bridges, X-box bridges, wired-out-of-limits conditions, or long runs of drop or multiple wire. After noting any abnormal conditions, and initiating corrective action, the remaining yellow tickets should be turned over to the appropriate Engineering group for further action.

Note: It should be observed that the extent of the needle swing into the yellow area of the meter scale, as indicated on the loop check ticket, can be directly related to the amount by which the design and use of the loop departs from standard. For example: Assume a given yellow ticket shows that the needle entered the yellow area of the meter scale to the 2 db mark. Examination of the records reveals 7000 ft. of bridged tap. However, this is *not* the only trouble on this loop. 1000 ft. excess bridged tap would cause the needle to enter the yellow only about 0.25 to 0.5 db. Further investigation should be made to find out what other defect exists on the loop.

3.03 The Engineering group will check the design, using the Loop Make-Up portion of the ticket, for excess bridged taps, inadequate loading, bridged tap between load coils, etc. (Observe the Note in Paragraph 3.02.) In general, if a loop is designed according to the rules outlined in AB22.075.2, it will show up "in the green" with the Loop Check System.

The "Length" and "Zero Set" dial settings used for the loop check should be compared with the actual length and resistance of the loop. If marked difference for both settings is apparent, a recheck with a Loop Checker would be in order. However, where only the "Length" setting appears to be in error, an estimate of the reading which would have been obtained had the correct setting been used, can be made as follows:

Assume a given yellow ticket shows that the needle entered the yellow area to about the 1 db mark. The "Length" setting used was 8 kf. The records show that this loop is actually 12 kf long. As outlined in Section AB22.090.1, the gain of the amplifier in the 24A Loop Checker is increased by about 0.25 db per kf as indicated by the LENGTH dial. Therefore, if the 12 kf setting had been used to check this particular loop, the Loop Checker sensitivity would have been increased by 4 kf, or 1 db, in which case it's a fair assumption that this loop would have checked OK.

3.04 Following the design review, projects should be initiated to bring the plant up to standard. There may be some situations where deviations from design standards are permitted on a temporary basis owing to pending completion of major outside plant projects such as feeder relief, area cuts, CO cutovers, etc. Such temporary deviations should not exceed 2 db and they should not exist for periods in excess of two years.

3.05 Any tickets remaining, for which design deficiencies are not found, should be returned to the Plant Service Center for a physical field check. The lines should be inspected for dead drops, dead X-box or CO bridges, excess drop wire length, or other unusual conditions. If no trouble can be found, the tickets should be referred to the appropriate group for special transmission investigation.

4. SPECIAL INVESTIGATIONS

4.01 The basic steps of analysis as outlined in the preceding paragraphs include the following items:

- (1) A check of assignment records to determine bridges or other conditions which may cause substandard transmission or a yellow reading.
- (2) A check of make-up to determine whether or not the loop meets design requirements.
- (3) A physical check by Plant forces to locate any unknown bridges or dead drops, etc.
- (4) Special investigations, where indicated, on any remaining trouble reports which were not cleared by the above steps.

4.02 Before embarking on detailed special investigations, the factors listed below are possible causes of "below par" indications which should be reviewed:

(1) Loading schemes other than H88, since the Loop Check System is based on the use of H88 in our plant. Where the loop is H44 loaded, if desired, a Loop Check may be repeated but in order to compensate for the fact that the 44 mh coils provide less gain than 88 mh coils, the "Length" dial should be set to "10" instead of "over 18." This appropriately increases the sensitivity of the Loop Checker.

(2) Excessive lengths of drop wire, especially in wet weather.

(3) If there is more than about 5 kf of rural wire in the loop, the loop may check below par if the wire is wet. A retest under dry conditions would serve to indicate whether or not the loop is OK otherwise.

(4) Local battery sets and long line equipment, owing to the fact that the loop check system is based on nominal 48V talking battery from the central office.

(5) If a party or extension station goes off-hook during the loop check a false indication will result. If the line is monitored, however, this should have been detected and a retest made after the line became idle.

(6) An improperly calibrated Loop Checker or Loop Checker Generator. B.S.P.'s in the "C" and "A" series provide procedures for properly maintaining the equipment.

(7) If a loop consists of open wire and cable, and the cable portion is loaded, an OK loop check should result. However, if the length is such that it is not loaded, and the total length to the test location is over 18 kf, a below-par reading may be obtained. If it is desired to recheck the loop, computations indicate that a satisfactory test should result if the Loop Checker sensitivity is increased by setting the "Length" dial to "18" instead of "over 18." At this setting the Loop Checker will read green unless the loop loss exceeds that of a limiting nonloaded loop.

(8) The customer's central office line equipment may contain a trouble condition. This can be checked by making a measurement of the 1000-cycle loss to the central office milliwatt. When connecting to the line appearance at the main frame, be sure to temporarily lift off the cable pair by removing the heat coils. The loss measured should be within 0.5 db of the average central office loss (posted on the 24B Loop Checker Generator) as determined for 24B Generator output-level adjustment.

4.03 Unfortunately, there is no simple clear-cut method for locating transmission irregularities on subscriber loops. However, a liberal application of ingenuity and judgment, plus an intimate knowledge of plant conditions in the area, will be of aid in ferreting out many problems. In the event the type of defect on a loop is not entirely clear from the action of the Loop Checker, discrete frequency measurements may be made between the station location and the CO main frame. Measure the loop insertion loss at 100-cycle steps from 500 to 3000 cycles.

On loaded loops, peaks and valleys in the loss frequency characteristic are indicative of loading irregularities (missing load, double load, one winding reversed, etc.), or a loaded bridged tap.

On nonloaded loops, a rising loss frequency characteristic, i.e., higher loss than expected at the higher frequencies, is an indication of excess bridged tap. Peaks and valleys in the loss-frequency characteristic would be caused by loaded bridged tap. If these tests do not disclose an irregularity, the subscriber line equipment should be checked.

4.04 Once the type of defect has been determined, it will be necessary to locate it by means of a very careful physical check, by toning the pairs, or, for the loaded pairs, by application of the methods outlined in the AB22.401 series of the B.S.P.'s. As experience is obtained with the Loop Check System it is hoped that more clear-cut methods of locating substandard conditions will be found.

5. REFERENCES

AB22.075.2, AG50.352	Subscriber Loop Resistance Design
C17.202	24A Loop Checker
AB22.090.1, AG15.210	J94024 Loop Checking System - General
AB22.090.3, AG15.212	Preparation of Loop Checker Distance Zone Map
F27.110, M28.14	Loop Check Ticket