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Recommendation M.600

ORGANIZATION OF ROUTINE MAINTENANCE MEASUREMENTS ON CIRCUITS

The organization of routine maintenance measurements on all telephone-type circuits should follow the general requirements given in Recommendation M.733.

Recommendation M.605

ROUTINE MAINTENANCE SCHEDULE

FOR INTERNATIONAL PUBLIC TELEPHONY CIRCUITS

1 General

3.2 Routine maintenance of international telephone circuits

In some Administrations this function may be delegated by the technical service, but in all cases the technical services are responsible for ensuring the satisfactory preparation and application of the schedule.

A schedule for the routine maintenance of the international public telephony circuits linking any two countries (including speech circuits of Signalling System No. 6), is drawn up by bilateral agreement between the technical services of the countries concerned. The programming of the tests to be performed within the agreed scheduled time is the responsibility of each Administration. It is for the circuit control stations to ensure that the routines are carried out within the agreed schedule except as allowed for in § 2.5 below.

2 Routine measurements carried out manually : establishment of the schedule

2.1 *Schedule form*

Figure 1/M.605 shows the form to be used for establishing the routine schedule; an example of its use is given in Figure 2/M.605.

As far as possible the schedule is drawn up on the principle of batch measurements of circuits on a given route and shows the days and times during which the routine maintenance measurements should be carried out.

Each international test centre will require a set of eight forms to cover the four weeks of the *odd* and the four weeks of the *even* months, four weeks constituting a month for the purpose of the schedule.

Week 1 is the first whole week of a month beginning with a Monday. Week 4 may include days belonging to the following calendar month.

Odd months denotes January, March, May, etc., and *even* months February, April, etc.

The schedule form allows for simultaneous testing on two different routes where two test positions are provided for routine measurements. If more than two routine test positions are available, additional or suitably modified forms will be required.

2.2 *Arranging the schedule*

The periodicity for circuit routines should be determined from Recommendation M.610.

The total time required to routine test all the circuits on a route should be assessed. It will depend on:

a) the total number of circuits,

b) the type of measurements and tests to be made, and

c) the expected rate of completion of routines for each circuit.

The determination of item c) will require particular care. The duration of circuit routines may be expected to differ from one test centre to another due to the different facilities provided: for example, circuit test access arrangements, and the organization of the work. Thus, no guidance can be given to the expected rate of completion of routines.

To reduce the need to make frequent changes to the schedule, due allowance should be made for any planned increase of the number of circuits on a route.

The individual testing periods may be of 1, 2, 3 or 4 hours duration. Where the total routine time required for a route would make a single testing period impracticable, two or more testing periods should be allocated to the route, but these periods should be separated in time by at least 4 hours.

The days and times of the testing periods will be decided by a bilateral agreement between the two technical services concerned. To initiate the scheduling of routines for a route, the technical service to which the circuit control station is responsible should request copies of the current schedule form from the distant end technical service day(s) and time(s) it proposes, choosing any unallocated periods on the forms for this purpose. The forms should then be returned to the distant technical service and agreement sought on the proposals

It is intended that individual testing periods be allocated to the circuits of one control station only. However, subject to the bilateral agreement between the two technical services involved, individual testing periods may be used on a common basis for the circuits of both control stations.

2.3 *Use of echo canceller devices*

The number of echo cancellation stages and the echo path delay characteristics must be stated in order to program tests properly using the echo canceller test facility as specified in Recommendation O.22 [1]. These characteristics should be included in ATME No. 2 schedule forms when exchanged between Administrations. If ATME No. 2 is not used between Administrations, echo canceller delay information should be conveyed by other means, for example a telex message, or the manual routine testing schedule (Figure 1/M.605).

2.4 *Changes to the schedule*

As far as possible testing periods should be chosen so that new circuits can be incorporated without change to the schedule.

Modifications to the days and/or times of testing for existing circuits, or expansion of the schedule to accommodate additional circuits or new routes should be determined by the technical service to which the circuit control station is responsible, in agreement with the other interested technical service(s). If the technical service responsible for a circuit sub-control station considers it necessary to alter the routine maintenance schedule , it should propose changes and obtain the agreement of the technical service responsible for the control station. Any intended modifications or additions to the schedule should be entered in red on a current copy which should be forwarded to the distant technical service(s) concerned. Agreement or counterproposals can then be made by any suitable means

2.5 *Programming of routine measurements and tests*

It is the responsibility of each Administration to decide how the agreed scheduled test periods should be utilized for the effective completion of routines on the circuits it controls.

This will involve determining the type of measurements and tests to be made on each circuit taking into account the recommended periodicities.

2.6 *Unscheduled periods*

Available periods in the schedule which are unallocated may be used for any purpose relating to circuit routines. Such use is on an *ad hoc* basis and each occasion must be agreed by the terminal control and sub-control stations concerned.

3 Circuit routines by automatic transmission measuring equipment ATME No. 2

3.1 *Schedule form*

For the orderly and effective use of ATME for circuit routines it is necessary to schedule its use.

For each distant end international centre an Administration will require the following information to enable it to make proposals for ATME routines on the circuits for which it has control responsibility:

a) type and quantity of responding facilities at distant end;

b) periods when distant end responding facilities are not scheduled for use;

c) periods to be avoided due to exchange peak traffic at distant end.

This information should be applied by the distant end Administration on request and use of a standard form for this purpose is considered necessary. The form to be used is shown in Figure 3/M.605; an example of its use is given in Figure 4/M.605. Weeks 1, 2, 3 and 4 and *odd* and *even* months are as defined in § 2.1 above.

For ATME No. 2, three types of responding facilities are possible (see Recommendation O.22 [1]):

type a — for signalling tests and transmission measurements;

type b — for signalling tests only;

type c — for busy flash tests.

Two forms will be required for *each type a* | and *b* | responding equipment to cater for *odd* | and *even* | months. If the controlling end wishes to conduct routines at monthly or more frequent intervals then appropriate entries will need to be made on both *odd* | and *even* | month forms.

The type of ATME No. 2 responding equipment (*type a* | or *b* | needs to be entered on the form. Each form should be given a unique reference number for administrative purposes.

Although two forms are required for each *type a* | and *b* | responding equipment, this does not imply that a particular responding equipment of the required type will be accessed. This will depend on local incoming arrangements.

Separate forms are *not* | required for *type c* | responding facilities. Where busy flash tests are to be made at the same time as transmission and/or signalling routines they should be considered as an extension of these routines and due allowance should be made for them when estimating the scheduled testing time required. An indication to show if *type c* responding facilities are or are not provided should be given on the schedule forms for *type a* and *b* | responders.

The incoming access address for each type of responding facility is standard for each signalling system (see the Recommendation cited in [2]) and need not be entered on the schedule form.

3.2 *Arranging the schedule*

The technical service of an Administration wishing to commence routine testing using its ATME directing equipment, or to modify its routine programme, should request a copy of the current schedule of responding equipment availability for the distant international centre(s) of interest from the technical service concerned. This schedule will be entered on the form given in Figure 3/M.605.

The technical service at the controlling (i.e., directing equipment) end should indicate the test period(s) it proposes on the schedule and return it to the distant end for agreement.

The technical service at the controlling end will need to take the following factors into consideration when determining the test periods required on a route:

a) circuit routine periodicity (from Recommendation M.610);

b) total routine time for all circuits on the route. This will depend on:

i) total number of circuits;

ii) type of tests and measurements;

iii) routine time for circuits;

c) quantity of available responding equipments of required type at distant end (This is required when it is intended to test with more than one directing equipment simultaneously to the same distant testing centre.);

d) quantity of directing equipments to be used;

e) that test periods should be multiples of 1 hour;

f) that busy traffic periods should be avoided.

To reduce the need to make frequent changes to the schedule, due allowance should be made for any planned increase of the number of circuits on a route.

3.3 *Utilization of scheduled test periods*

It is the responsibility of each Administration to decide how the agreed scheduled test periods should be utilized for the effective completion of routines on the circuit it controls.

3.4 *Unscheduled periods*

Demand testing with ATME No. 2.

During the busy traffic period, when ATME No. 2 is not being used for routine testing, it can serve the need to permit single and rapid circuit testing on a demand basis for fault location and for testing of individual circuits following fault clearance, as well as for testing of new circuits to be added. For this reason responding equipments should be available at all times. Demand testing of large numbers of circuits for whatever purpose should be agreed between testing centres concerned.

3.5 *Utilization of directing equipment*

In addition to a current schedule of the availability of responding equipments at each of its international centres for the information of other Administrations, each Administration will have to maintain a schedule of the utilization of its own directing equipments. This is a matter for each Administration to arrange and does not require formulating by CCITT but the same type of form may also be used as indicated in Figure 5/M.605.

3.6 *Down time of ATME No. 2 equipment*

If ATME No. 2 equipment is to be out of service for a long period of time (several days), e.g. due to a fault condition or rearrangements in the international centre, so that automatic testing cannot be carried out or is heavily affected, the Administrations concerned should be advised accordingly.

Figure 1/M.605 p.

Figure 2/M.605 p.

Figure 3/M.605 p.

Figure 4/M.605 p.

Figure 5/M.605 p.

References

[1] CCITT Recommendation *CCITT automatic transmission measuring and signalling testing equipment ATME No 2.* , Vol. IV, Rec. O.22.

[2] CCITT Recommendation *Maintenance access lines* , | Vol. IV Rec. O.11.

Recommendation M.610

PERIODICITY OF MAINTENANCE MEASUREMENTS ON CIRCUITS

Routine maintenance measurements should be made on a complete circuit and should comprise measurements of:

a) overall loss and levels at one frequency;

b) overall loss and levels at several frequencies;

c) stability (for two-wire audio circuits or sections of circuit only);

d) signalling;

e) noise;

f) echo control devices.

The periodicity for measurements of loss, noise, stability and signalling is given in Tables 1/M.610 and 2/M.610; in addition, other types of measurements are given in Table 1/M.610 for which the periodicity may be determined by the Administrations concerned.

Table 1/M.610 shows the periodicity for measurements on the types of circuit normally used in the international telephone network (except for frontier circuits). When automatic transmission measuring and testing equipments are available, transmission measurements and signalling tests may be carried out more frequently than indicated in this table.

Echo control devices (echo suppressors or cancellers) may be tested using semi-automatic/automatic test instruments or facilities when such are deployed by Administrations. If semi-automatic/automatic instruments, etc., are not available, Administrations should agree bilaterally regarding these tests.

These circuits are:

— 4-wire audio-frequency circuits. Included also in this category are circuits on carrier systems providing a small number of telephone channels. No distinction is made between circuits in underground cables and circuits on open-wire lines unless the open-wire section is equipped with repeaters;

— 4-wire carrier circuits on telephone channels of systems providing at least one group;

— 4-wire circuits of mixed constitution, i.e. consisting of a mixture of audio and carrier sections.

Table 2/M.610 shows the periodicity of measurements to be made on short-distance international circuits that are generally used for terminal traffic, but which can, when necessary, be used to extend more important international circuits. It is desirable that the same recommendations be applied to national circuits that are frequently used for international communications.

This is the general rule. In a few exceptional cases, however, routine measurements may be found desirable on constituent elements of circuits if they can give indications not otherwise readily obtained. For example, in accordance with Recommendation G.131 § 2.4 [1], echo suppressors are not necessarily permanently associated with circuits and must then be checked by separate in-station tests as provided in Recommendation M.660. Also, in some special cases mentioned in the introductory notes to that Recommendation, the complete-circuit measurements afforded by the ESTS instrument, specified in Recommendation O.25 [2], might be found inadequate.

H.T. [T1.610]

TABLE 1/M.610
{
Periodicity of measurements and tests to be made on international telephone circuits
(circuits normally used in the international network)
}

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7		
Type of Circuit	Description	{						
{	{ 6 months	6 months						
{ 4-wire circuits of mixed constitution } As agreed in accordance with need and experience }		At least monthly or as agreed	Yearly	{				

a) Measurements of overall loss at one frequency and of noise shown in column 3 are included in the measurements made at several frequencies shown in column 4.

b) Assumes the use of an echo suppressor test facility as part of an ATME as specified in Recommendation O.22 [3].

c) Assumes the use of an echo canceller test facility as part of an ATME as specified in Recommendation O.22 [3].

Tableau 1/M.610 [T1.610] p.

H.T. [T2.610]

TABLE 2/M.610

Periodicity of measurements to be made on international telephone circuits

(Types of circuit not normally used in the international network)

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	
Category of circuit	Type of circuit	{			Manual circuits	Automatic circuits

Tableau 2/M.610 [T2.610] p.

References

[1] CCITT Recommendation *Stability and echo* , | Vol. III, Rec. G.131.

[2] CCITT Recommendation *Semi-automatic in-circuit echo suppressor testing system (ESTS)* , | Vol. IV Rec. O.25.

[3] CCITT Recommendation *CCITT automatic transmission measuring and signalling testing equipment ATME No. 2* , | Vol. IV, O.22.

Recommendation M.620

METHODS FOR CARRYING OUT ROUTINE MEASUREMENTS ON CIRCUITS

1 Measurements and tests carried out manually

1.1 *Measurements of overall loss*

The measurements should be made by applying to the circuit access points (see Recommendation M.565, § 2) test signals at a level of —10 dBm0:

— at the frequency of 1020 Hz when measurements are confined to one frequency;

— at frequencies of 400, 1020 and 2800 Hz, when measurements are made at more than one frequency. Measurements may be made at additional frequencies if required.

Whenever automatic level recorders or display sets are available at the ends of the circuit, the measurements should be made with this equipment at all frequencies over the range of interest.

1.2 *Noise measurements*

The psophometric noise power as indicated by a CCITT psophometer should be measured in both directions of transmission. It would be useful to make this measurement at the same time as the measurement of overall loss.

1.3 *Signalling tests*

1.3.1 *Manually operated circuits*

The power of the voice-frequency signalling current, in its normal operating condition, should be measured at the same time as the overall loss at several frequencies is measured.

If *n* | is the relative power level at the point of measurement, the measured absolute power level of the signalling current transmitted at 500/20-Hz interrupted signalling current should fall within the following limits:

$$(n - 3) \pm 1/2 \text{ dB}$$

assuming that the signalling units used conform to the specifications of the Series Q Recommendations.

The operation of the voice-frequency signalling receivers is tested as an in-station test.

For information, the operating limits of the signalling receiver are as follows:

If *n* | is the relative power level at the point of connection in the circuit where the receiver is connected, it will operate reliably when the absolute power level *N* of the signalling current at the input of the receiver falls within the following limits:

$$-8.5 + n \quad N \quad + 2.5 + n \text{ dB.}$$

For further information about the choice of the signal frequency, refer to Recommendation O.6 [1].

1.3.2 *Semi-automatic or automatic circuits*

See Recommendation M.732.

1.4 *Records*

All the results of measurements and tests should be recorded by the control and sub-control stations concerned.

2 Use of automatic transmission measuring and signalling testing equipment — ATME No. 2

See Recommendation O.22 [2].

2.1 *Transmission measurements*

When ATME No. 2 is available for the routine maintenance of automatic and semi-automatic international circuits, it should be used to make the following measurements:

— overall loss at 1020 Hz or at 400, 1020 and 2800 Hz, as required;

— psophometric noise power level.

The test frequencies for overall loss measurements should be at a level of —10 dBm0.

2.2 *Signalling tests*

The signalling functions involved in the setting-up and clearing down of a connection between the directing and responding equipments will be checked during each test call. In addition, ATME No. 2 should be used to make the following line signalling tests:

— forward transfer (where provided),

— clear back,

— re-answer,

— busy flash.

Note — It is inappropriate to perform a signalling test using a Type B ATME No. 2 responder on Signalling System No. 6 speech circuits.

2.3 *Test of echo control devices*

Echo control devices may be tested using an appropriate test system such as that specifies as an option in Recommendation O.22 [2]. If a test system is not available, then subjective test calls may be used. However it should be noted that these test calls will not quantitatively assess echo control device performance [3].

3 Corrective action

3.1 *Readjustment of overall loss*

When, during a routine measurement, the overall loss at 1020 Hz is not equal to its nominal value, the procedure below should be followed.

Deviations of less than ± | dB from nominal shall be deemed not to require adjustment. If measurements at a terminal station reveal a deviation from the nominal value of ± | .0 dB up to and including ± | .5 dB, adjustment to as near the nominal value as possible should be made at the terminal station and if practical at any intermediate station involved. Where it is appropriate and practical to do so, adjustment shall be made on the group or supergroup links in accordance with Recommendation M.530. If the deviation from nominal exceeds ± | .5 dB a fault should be suspected which should be sought and cleared. If no fault is found, readjustment should be carried out at the intermediate and terminal stations as necessary, with particular attention to alignment of the group and supergroup link or links that may be involved.

3.2 *Measurements at more than one frequency*

When measurements are made at more than one frequency, a check should be made to ensure that the values obtained are within the limits permitted (see Tables 1/M.580, 2/M.580 and 3/M.580). If they are not, appropriate steps should be taken.

3.3 *Noise measurements*

It should be noted that any substantial deterioration in performance from the original line-up value may serve to indicate a fault. Comparison should also be made to noise measurements on circuits of identical or similar constitution to help locate a possible fault.

4 Other measurements without recommended periodicity

a) Systematic subjective testing, see Recommendation M.731;

b) Measurement of signal-to-crosstalk ratio between *go* and *return* channels. The measured signal-to- crosstalk ratio should not be less than 43 dB;

c) Frequency errors arising from frequency translation. The difference between the sent and received audio frequencies should not exceed 2 Hz. See Recommendation O.111 [4] for a method of measuring this error.

References

[1] CCITT Recommendation *1020 Hz reference test frequency* , Vol. IV, Rec. O.6.

[2] CCITT Recommendation *CCITT automatic transmission measuring and and signalling testing equipment ATME No. 2* , Vol. IV, Rec. O.22.

[3] *Rapid verification test for echo control devices* , | Vol. IV, Supplement No. 2.11.

[4] CCITT Recommendation *Frequency shift measuring equipment for use on carrier channels* , | Vol. IV, Rec. O.111.

Recommendation M.630

MAINTENANCE OF CIRCUITS USING CONTROL CHART METHODS

Administrations may replace the periodical measurements specified in Recommendations M.610 and M.620 by measurements using sampling methods. They will need to arrange their own programme for these on a bilateral basis. Administrations applying such methods are requested to report their conclusions to the CCITT giving their comments on:

— the method used (for information, some methods are described in [1];

— the saving in manpower;

— the transference of work from field staff to administrative offices;

— any observed change in the quality of groups of circuits maintained by sampling methods.

Reference

[1] CCITT Handbook on *Quality of service, network management and network maintenance* , | ITU, Geneva, 1984.

Recommendation M.650

ROUTINE LINE MEASUREMENTS TO BE MADE ON THE LINE REPEATERS OF AUDIO-FREQUENCY SECTIONS OR CIRCUITS

Besides the routine tests made from end-to-end on the complete circuit, routine maintenance measurements of the equipment of audio-frequency circuits should be made throughout the line for purposes of repeater maintenance.

These routine measurements comprise:

— measurements of repeater gain (where there is little or no feedback);

— measurements of *relative level* at the output of the repeaters (when measuring overall loss on the complete circuit, in the frontier stations and wherever else such measurements are considered necessary);

— measurements of circuit *stability* and test for determining singing points (with 2-wire repeaters).

The measurement of stability is obtained from the definition of stability σ of the circuit considered:

$$\sigma = q - (q_1 + q_2)B/F2$$

q being the mean of the nominal overall loss of the circuit in each of the two directions of transmission under normal working conditions and q_1 and q_2 being the singing points measured for the two directions of transmission respectively.

In order to measure these singing points in the case of a 2-wire circuit, singing is started by increasing, step-by-step and simultaneously for the two directions of transmission, the gains of one or of several repeaters (preferably those in the middle of the circuits because they are usually in the most critical position from the point of view of singing). Having done this, without touching the adjustment which has been obtained, the transmission in the reverse direction is suppressed and the overall loss of the circuit at 1020 Hz is measured for the forward direction of transmission; this is the singing point q_1 above. Next the transmission in the first direction is suppressed and the overall loss of the circuit at 1020 Hz is measured for the reverse direction of transmission: this is the singing point q_2 above.

When the circuit is composed of 2-wire and 4-wire sections, or carrier sections, the method of measurement given for 2-wire circuits is valid.

This stability should be determined with the ends of the circuit open-circuited; when there are high-impedance relays permanently connected across the line during a call, these relays may remain during stability tests.

Recommendation M.660

PERIODICAL IN-STATION TESTS OF ECHO SUPPRESSORS COMPLYING

WITH RECOMMENDATIONS G.161 AND G.164

Note 1 — Certain of the tests in this Recommendation may conveniently be carried out on an in-station (or in-circuit) basis using measuring equipment to the specification in Recommendation O.25 [1]. This equipment will not provide reliable test results for a circuit which is routed through circuit multiplication systems (CMS) employing interpolation techniques [this includes the case where a circuit is routed over time division multiple access/digital speech interpolation (TDMA/DSI) satellite channels] and therefore should not be used in this instance unless a permanent trunk-channel association in both directions of transmission can be made for

the duration of the test sequence. The reason for this is that without such a trunk-channel association, circuit continuity may not be maintained within the CMS in the absence of a signal and during very low signal level conditions.

Note 2 — The tests and periodicities specified in this Recommendation have been prepared to meet the needs of echo suppressors conforming to Recommendations G.161 [2] and G.164 [3].

1 Tests and periodicities applied to valve, rectifier and relay type echo suppressors

1.1 The following tests should be made monthly:

1.1.1 *Check of suppression operate level*

If not within ± | dB of the initial value, readjust to be as close to the initial value as possible.

1.1.2 *Check of suppression loss (blocking attenuation)*

The suppression loss should not be less than 30 dB in the frequency range 200 | (hy | 500 Hz and not less than 40 dB in the range 1000 | (hy | 500 Hz.

1.1.3 *Check of differential sensitivity*

a) Check that the suppression loss is removed in the presence of signal on the send path of sufficient magnitude as compared with a signal on the receive path. This check should be made with magnitudes of the signal on the receive path, ranging from the operate level to the expected maximum speech level.

b) Check also that the suppression loss is not removed by the echo produced under the conditions corresponding to the worst expected return loss. Use of an interrupted signal at the operate-frequency or a test speech signal is likely to be effective for this check.

Note — These tests will be necessary when the break-in function is provided.

1.1.4 *Check of disabling facilities*

a) Some echo suppressors can be disabled by the associated signalling and switching equipment. The correct performance of this function, when provided, should be checked.

b) Some echo suppressors can be disabled by special audio frequency signals on the circuit. The correct performance of this function, when provided, should be checked.

1.2 The following characteristic times should be measured every six months and if they are not within 20% of the initial values they should be readjusted to be as close to the initial values as possible.

1.2.1 *Suppression operate times*

a) Relay-type echo suppressor. The operate time should not exceed 4 ms. Alternatively, the operate time should not be greater than 12 ms with a test signal at the operating frequency and 3 dB above the operate level.

b) Valve or rectifier type echo suppressor. The operate time should not exceed 4 ms. The period subsequent to the operate time, during which the specified suppression loss is achieved, should not exceed 0.5 ms. Thereafter, as long as the test signal is applied, the loss should not fall below that specified.

1.2.2 *Suppression hangover time*

The hangover time of the echo suppressor should be 50 ms. Exceptionally, where there is a long chain of national or international circuits beyond the point where the half-echo suppressor is fitted, the hangover time should be 70 ms.

2 Tests and periodicities applicable to semi-conductor type echo suppressors

2.1 The following tests should be made every six months:

2.1.1 *Check of suppression operate level*

If not within ± | dB of —31 dBm0 readjust to be as close to this level as possible.

2.1.2 *Check of suppression loss*

The suppression loss should be at least 50 dB.

2.1.3 *Check of break-in differential sensitivity and receive loss*

Check that the suppression loss is removed when the signal applied to the send-in port is within ± | dB of the level of a signal of

the same frequency applied to the receive-in port. The level of the signal applied at the receive-in port should be between —15 and —20 dBm0. Check that the loss in the receive path (receive loss), when break-in occurs is between 5 and 15 dB when the level applied at the receive-in port is in the range —15 to —20 dBm0.

2.1.4 *Check of signalling disabling*

The operation and release of the signalling disabler circuit should be checked.

2.1.5 *Check of tone disabling*

The characteristics of the tone disabler circuit should be checked and should be within the following limits:

a) *Disabler sensitivity*

The disabler should operate for any single frequency within the disabling design range at a level of —30 dBm0.

The disabler should be released when the disabling tone is reduced to a level of —36 dBm0.

b) *Guard sensitivity*

With either a 1020 Hz signal applied to the receive-in port and a 2100 Hz signal at a level of —28 dBm0 applied simultaneously to the send-in port, the suppressor should disable when the level of the 1020 Hz signal is below —33 dBm0 and should not disable when this signal is above —28 dBm0.

c) *Broadband holding and release*

Once disabled a —31 dBm0 signal of either 1020 Hz should hold disabling and a —36 dBm0 signal should not.

2.2 The following characteristic times should be measured every six months and should be within the limits shown:

2.2.1 *Suppression*

a) Suppression operate time: 5 ms (maximum).

b) Suppression hangover time: 40-75 ms.

2.2.2 *Break-in*

a) Break-in operate time: 30 ms (maximum).

b) Break-in hangover time: 150-350 ms.

2.2.3 *Tone disability*

a) Tone disabler operate time: 300 ± 100 ms.

b) Tone disabler hangover time: 250 ± 150 ms.

Note — The disabler should not release for breaks of less than 100 ms in the disabling tone.

(For definitions of terms see Recommendation G.161 [2].)

3 Tests and periodicities applicable to echo suppressors conforming to Recommendation G.164

3.1 The following tests should be made, e.g. every six months.

Note 1 — If the echo suppressor interface is digital (for example, 2048 kbit/s) the levels prescribed for the various tests are coded in corresponding bit sequences.

Note 2 — Modern digital techniques may allow the tests listed below to be carried out continuously without causing any disturbance of the traffic on the circuit (in-built test system).

3.1.1 *Check of suppression operate level*

The operate level in the receive paths should be within ± | dB of —31 dBm0.

3.1.2 *Check of suppression loss*

The suppression loss should be at least 50 dB.

3.1.3 *Check of break-in differential sensitivity and receive loss*

Check that the suppression loss is removed when the signal applied to the send-in port is within the range 0 to —3 dB of the level of a signal of the same frequency applied to the receive-in port. The level of the signal applied at the receive-in port should be any single value within the range —15 and —20 dBm0.

Check that the loss in the receive path (receive loss), when break-in occurs, corresponds to the design value of the echo suppressor when the level applied at the receive-in port is in the range —15 dBm0 to —20 dBm0.

3.1.4 *Check of signalling disabling*

The operation and release of the signalling disable circuit should be checked.

3.1.5 *Check of tone disabling*

The characteristics of the tone disabler circuit should be checked and should be within the following limits:

a) Disabler sensitivity

The disabler should operate for any single frequency within the disabling design range at a level of —30 dBm0. The disabler should be released when the disabling tone is reduced to a level of —36 dBm0.

b) Broadband holding and release

Once disabled, a —31 dBm0 signal of 1020 Hz or a corresponding bit sequence should hold disabling and a —36 dBm0 signal should not.

3.2 The following characteristic times should be measured and should be within the limits shown:

3.2.1 *Suppression*

a) Suppression operate time: 1 ms (see Note under § 3.2.2).

b) Suppression hangover time: 24-36 ms.

3.2.2 *Break-in* | (L_R = constant)

See Table 1/M.660.

H.T. [T1.660]
TABLE 1/M.660
Time conditions for break-in

Function	Operate times	Hangover times
Partial break-in	2 ms (see Note)	26 ms
Full break-in	6-10 ms	T 48-66 ms *L*

R: Level of signal at receive-in ports.

Note — Some types of built-in processor-controlled digital test systems use scanning periods in excess of these values (for example, 4 ms) and would therefore affect the measured values. It is for Administrations using such test systems to assess the impact of this ambiguity and to determine the need for any supplementary tests.

Table 1/M.660 [T1.660], p.

3.2.3 *Tone disability*

a) Tone disabler operate time: 300 ± 100 ms.

b) Tone disabler hangover time: 250 ± 150 ms (release time).

Note — The disabler should not release for breaks of less than 100 ms in the disabling tone (for definitions of terms, see Recommendation G.164 [3]).

3.3 *Adaptive function*

If the echo suppressor incorporates the adaptive function, the following test should be made:

Check that the break-in sensitivity of the echo suppressor increases at a speed of at least 4 dB/s during the phase of convergence if a level greater than —20 dBm0 is applied to the input of the receive equipment.

3.4 *Consequence*

If an echo suppressor is found not to comply with one of these tests, it should be taken out of service.

References

[1] CCITT Recommendation *Semi-automatic in-circuit echo suppressor testing system (ESTS)* , Vol. IV, Rec. O.25.

[2] CCITT Recommendation *Echo suppressors suitable for circuits having either short or long propagation times* , Orange Book, Vol. III, Rec. G.161, ITU, Geneva, 1977.

[3] CCITT Recommendation *Echo suppressors* , Vol. III, Rec. G.164.

Recommendation M.665

TESTING OF ECHO CANCELLERS

This Recommendation applies to all echo cancellers specified in accordance with Recommendation G.165 [1], which are located either in international or national networks and which are used for international calls.

1 Periodicity of routine tests

Echo cancellers should be tested every six months.

2 Cancellers which are permanently associated with international circuits

Administrations should choose one of the following methods of canceller testing

2.1 *Tests using the Echo Canceller Test System (ECTS) or Automatic Transmission Measuring Equipment (ATME) with ECTS facilities*

If the Administrations at each end of a circuit have an ECTS or ECTS facilities specified in accordance with Recommendation O.22 [2], these should be used for in-circuit canceller testing. The following Recommendations should be referred to: Recommendations M.605, M.610 and M.620.

2.2 *Tests using an In-Station-Echo canceller Tester (ISET)*

The following pass/fail tests should be made and where a faulty canceller is identified, it should undergo the tests, including those of tone disabling, which are specified in Recommendation G.165 [1].

Note 1 — If the echo canceller interface is digital (for example 8448, 2048 or 1544 kbit/s) the levels prescribed for the various tests are coded in corresponding bit sequences.

Note 2 — Modern digital techniques may allow the tests listed below to be carried out continuously without using any disturbance to the traffic on the circuit (in-built test system).

Note 3 — The specification of an in-station echo canceller tester is given in Recommendation O.27 [3].

These tests can be made on an echo canceller while in-circuit, such that the adaptation and the non-linear processing are activated. Access to the echo canceller to be tested will be on a 4-wire basis and the tests will be made by applying test signals to the ‘‘receive-in’’ and the ‘‘send-in’’ ports of the echo canceller. The signals level at the ‘‘send-out’’ port will be measured.

The pass/fail tests consist of the following items:

- steady state residual and returned echo level test;
- convergence test;
- performance under conditions of double-talk -A;
- performance under conditions of double-talk-B;
- infinite return loss convergence test;
- tone disabler control signal detection sensitivity, DIS S;
- tone disabler control signal detection sensitivity, DIS R.

(This list is provisional and is the subject of further study.)

3 Cancellers permanently associated with national circuits

Administrations should choose one of the following methods of canceller testing:

— the use of ECTS or ECTS facilities as part of an ATME-type equipment (where this equipment is provided at both ends of a circuit); or

— the use of an in-station tester. Tests to be performed are listed in § 2.2.

4 Testing of pooled cancellers

When echo cancellers are not permanently associated with circuits, Administrations should use an in-station tester. Tests to be performed are listed in § 2.2.

5 Use of group-diagnostics

This method of testing is under study. It comprises self-diagnostics which are shared between cancellers on a per rack or per shelf basis and which perform tests similar to those of an in-station tester. The advantages of using this method are that tests can be made very frequently, thus obviating the need for routine testing, and that a failure can be very quickly brought to the attention of maintenance staff.

References

[1] CCITT Recommendation *Echo cancellers* , | Vol. III, Rec. G.165.

[2] CCITT Recommendation *CCITT automatic transmission measuring and signalling testing equipment ATME No. 2* , | Vol. IV, Rec. O.22.

[3] CCITT Recommendation *In-station echo canceller tester* , | Vol. IV, Rec. O.27.

Recommendation M.670

MAINTENANCE OF A CIRCUIT FITTED WITH A COMPANDOR

1 In-station tests

The compandor should be tested at intervals determined by the Administration. The tests should be in accordance with the appropriate design information which should be made available in a suitable form to the repeater station staff.

2 Circuit tests

No special objective test of the circuit to check the operation of the compandor is recommended, but when the circuit is routine tested a speaking test should also be made.

The unaffected level of the circuit and the noise advantage should be checked in accordance with § 3 of Recommendation M.590, at intervals determined by the Administration.

3.3 Maintenance of demand assignment circuits

Recommendation M.675

LINING UP AND MAINTAINING INTERNATIONAL DEMAND ASSIGNMENT CIRCUITS (SPADE)

General

Section 3.3 refers to Figure 1/M.675 and describes the features of *demand assignment (DA) circuits* established by means of single channel per carrier, PCM, multiple access demand assignment, equipment (SPADE) located in satellite earth stations.

Circuits thus provided are established between two international exchanges (CTs) on demand, with the constituent transmission paths making up the circuit being connected only for the duration of each demand. A transmission link is established between earth stations as required by the outgoing CT. The international DA circuit is formed via the distant earth station and its connection to the incoming CT by the terrestrial demand assignment section.

Upon release of this demand the transmission link establishing the demand assignment section is returned to a common pool allowing its reuse when required by other international exchanges operating in the demand assignment satellite network. Recommendation Q.48 [1] outlines the signalling system incorporated between demand assignment equipments located in satellite earth stations.

In general the Series M Recommendations concerned with preassigned international circuits apply equally to the sections of DA circuits. However, because of the variable nature concerning the establishment of circuits on demand, special consideration in provisioning, maintenance and fault finding

is required. The following sections will provide details concerning these requirements.

1 Initial line-up and maintenance of demand assignment circuits and their constituent parts

1.1 The demand assignment circuit may be seen as being divided into three parts for setting-up, lining-up and maintenance: the outgoing terrestrial demand assignment section, the satellite demand assignment section and the incoming terrestrial demand assignment section. It is considered that the overall limits in Recommendation M.580 will be met by the application of the line-up limits given in Table 1/M.675 for the individual DA sections. However, sectional requirements prevail if the limits of Recommendation M.580 are not met on overall measurements.

1.2 The maintenance schedule, Table 2/M.675, should be utilized in the development of an initial demand assignment capability with a given CT (for example, commissioning of a new SPADE terminal) and establishing the appropriate periodic tests.

1.3 When terrestrial DA sections are added or a new corresponding terminal comes into service, tests should be conducted in accordance with Table 2/M.675.

2 Demand assignment circuit control responsibilities and fault location procedures

2.1 In the assignment of maintenance responsibilities, recognition is given to the constitution of a DA circuit as outlined in § 1.1 above. Section control and sub-control stations will be nominated for each terrestrial DA section. The initiation of fault

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This type circuit may be considered to be equivalent to an international telephone circuit (preassigned) from a transmission point of view and is under study by Study Group XII.

localization procedures for a faulty DA circuit will be the responsibility of the fault report point (circuit) receiving the report. Upon being notified, the control station initiates tests to determine the location of the fault. If the fault condition is located beyond the satellite DA section, the fault report point (circuit) associated with the distant terrestrial DA section will be notified of the condition and will assume control responsibility for further localization and clearance of the fault.

2.2 Faults should be investigated in a systematic manner, section by

section. After verifying the report, e.g., by performance records or test calls, a recommended procedure for fault location is as follows:

2.2.1 Establish a CT to one’s own CT satellite loop circuit, utilizing the suspected outgoing terrestrial DA section.

2.2.2 Determine if this configuration is faulty. If this is not the case then the associated earth station should, as sub-control, be instructed to check the satellite DA section to the particular distant earth station involved. If this section is found to be performing satisfactorily then the fault report is passed to the fault report point (circuit) at the distant CT. The distant CT then assumes responsibility for fault localization and the originating fault report point (circuit) advises its associated network analysis point of the action taken.

2.2.3 If the satellite loop of § 2.2.1 above was found faulty, action should be taken by the control station and its associated DA terminal to localize the fault to the outgoing terrestrial DA section.

2.3 Full use should be made of the operational status indications available to the DA satellite section sub-control station to determine fault

situations on the outgoing terrestrial DA section and on the incoming and outgoing satellite DA sections. The DA section sub-control station should advise the fault report point (circuit) or fault report point (network), as appropriate, at its associated CT, of any observations indicating fault situations and ensure that the control station is aware of the situation.

2.4 Administrations establishing international circuits utilizing satellite demand assignment links should be able to obtain statistical information concerning the outgoing call processing of their respective countries from the demand assignment system operating authority. The information is required by the network analysis points, in their continuing analysis of the quality of the international network.

Blanc

Figure 1/M.675 p 9

Figure 2/M.675 p. 10

H.T. [T1.675]

TABLE 1/M.675

Target objectives for setting up and lining up
a demand assignment (SPADE)
international public telephone circuit and its sections

Demand assignment circuit {

{

Transmission parameters

{

{

{
1.
Loss/frequency | ua)
relative to the loss at reference
frequency (in dB)
}

(Series M Recommendations)

{
300- 400 Hz
400- 600 Hz
600-2400 Hz
2400-3000 Hz
3000-3400 Hz
}

{
+3.5 to —1.0
+2.0 to —1.0

+1.0 to —1.0

+2.0 to —1.0

+3.5 to —1.0
}

{
+0.5 to —0.5
+0.5 to —0.5

+0.5 to —0.5

+0.9 to —0.5

+1.8 to —0.5
}

{
+1.7 to —0.5
+0.9 to —0.5

+0.5 to —0.5

+0.9 to —0.5

+1.7 to —0.5
}
{
2.

Overall loss at reference frequency. Line-up level limits relative to nominal (in dB) }	± 0.3	± 0.2	± 0.2
3. Idle Noise (—dBm0p)	Table 4/M.580 (See Note 3)	—60	Table 4/M.580
{ 4. Quantizing distortion (signal/total distortion ratio in dB) }	Not applicable	Figure 2/M.675 (See Note 1)	Not applicable
{ 5. Signal crosstalk ratio (Go-return) (in dB) }	43	60	48

a) Reference frequency = 1020 Hz (See Note 2).

Note 1 — Quantizing distortion should be measured in accordance with the test procedure agreed upon by the satellite system operators.

Note 2 — Test frequencies that are sub-harmonics of the PCM sampling rate should be avoided. (See Rec. O.6 [2].)

Note 3 — Noise measurements should be made with the demand assignment codec voice detector enabled. This can be accomplished by utilizing a holding tone and notch filter or by conducting tests with the demand assignment equipment, in the pre-assigned mode.

Tableau 1/M.675 [T1.675], p. 11

H.T. [T1.610]

TABLE 1/M.610
{
Periodicity of measurements and tests to be made on international telephone circuits
(circuits normally used in the international network)
}

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7
Type of Circuit	Description	{				

	{ 6 months	6 months			
{ 4-wire circuits of mixed constitution } As agreed in accordance with need and experience }		At least monthly or as agreed	Yearly	{	

a) Measurements of overall loss at one frequency and of noise shown in column 3 are included in the measurements made at several frequencies shown in column 4.

b) Assumes the use of an echo suppressor test facility as part of an ATME as specified in Recommendation O.22 [3].

c) Assumes the use of an echo canceller test facility as part of an ATME as specified in Recommendation O.22 [3].

Tableau 2/M.675 [1T2.675], p. 12

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H.T. [T1.610]

TABLE 1/M.610
{
Periodicity of measurements and tests to be made on international telephone circuits
(circuits normally used in the international network)
}

Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7		
Type of Circuit	Description	{						
{	{ 6 months	6 months						
{ 4-wire circuits of mixed constitution } As agreed in accordance with need and experience }		At least monthly or as agreed	Yearly	{				

a) Measurements of overall loss at one frequency and of noise shown in column 3 are included in the measurements made at several frequencies shown in column 4.

b) Assumes the use of an echo suppressor test facility as part of an ATME as specified in Recommendation O.22 [3].

c) Assumes the use of an echo canceller test facility as part of an ATME as specified in Recommendation O.22 [3].

Tableau 2/M.675 [2T2.675], p. 12

References

[1] CCITT Recommendation *Demand assignment signalling systems* , Vol. VI, Rec. Q.48.

[2] CCITT Recommendation *1020 Hz reference test frquency* , Vol. IV, Rec. O.6.

[3] CCITT Recommendation *Manual testing* , Green Book, Vol. VI-2, Rec. Q.163, § 4.3.4, parts 1 and 2, ITU, Geneva, 1973.

[4] Ibid., § 4.3.3.

3.4 Guiding principles for the maintenance of the international automatic telephone service

The guiding principles for the maintenance of the automatic telephone service deal with the division of responsibility for the maintenance of international automatic or semi-automatic telephone circuits between the concerned maintenance elements. These principles which are intended to cover circuits and networks provided by wholly analogue systems, wholly digital systems, or a mixture of analogue and digital systems, are found in Recommendations M.710 to M.734. The maintenance organization for transmission systems and leased and special circuits is outlined in Recommendation M.70.

Recommendation M.710

GENERAL MAINTENANCE ORGANIZATION

FOR THE INTERNATIONAL AUTOMATIC AND SEMI-AUTOMATIC TELEPHONE SERVICE

1 General

To ensure satisfactory service quality in the international automatic and semi-automatic telephone service, it is necessary to have an organization which can use the techniques recommended for achieving this. The organizational elements defined in § 2 below relate to the maintenance of the different component parts of the international automatic network and are intended to cover wholly analogue networks and networks provided by a mixture of analogue and digital systems (switching and transmission). Administrations

are requested to apply these recommendations in order to obtain satisfactory service quality.

The phrase *general maintenance organization* does not necessarily relate to a specific organizational structure in any particular Administration.

The organization for international network management is specified in Recommendation E.413 [1], but it has been recognized that many common points exist between maintenance and network management activities. Therefore, it must be noted that, although the general maintenance organization and the network management organization are separately specified, it is not intended that separate organizations be established unless so desired by Administrations.

2 Maintenance organization

2.1 *Basic elements and their functions*

Cooperation in the maintenance of the international automatic and semi-automatic telephone service should be based on an organization which comprises all of the following basic elements in each country — each element representing a set of functions:

2.1.1 *Fault report point (circuit)* , which accepts and assigns for clearance all faults relating to one, or more, specifically identified circuits.

The use of the word *network* in this and subsequent Recommendations, refers to the public telephone network. This does not restrict the combination of any element with other maintenance units which have functions dedicated to services not noted herein.

2.1.2 *Fault report point (network)* , which accepts and assigns for clearance all faults that, when reported, are not identified with specific circuits or a specific international centre. This should include all switching difficulties.

2.1.3 *Testing point (transmission)* , which performs transmission testing on international circuits for lining-up purposes, on a routine basis, and in case of reported faults.

2.1.4 *Testing point (line signalling)* , which performs testing of line signalling on international circuits, employing channel associated signalling, for setting-up purposes, on a routine basis, and in case of reported faults.

Note — Testing line signalling is not relevant to Signalling System No. 6. Maintenance organization aspects of Signalling System No. 6 are dealt with in Recommendation M.762 while signalling tests are dealt with in Recommendation M.732.

2.1.5 *Testing point (switching and interregister signalling)* , which performs testing of switching and interregister signalling on international equipment for setting-up purposes, on a routine basis, or in case of reported faults.

2.1.6 *Network analysis point* , which receives information on service quality, and faults not identified with specific circuits. It carries out the analysis of this information to investigate the problems involved. It acts as a single point of contact for general enquiries concerning the maintenance of the international telephone network.

2.1.7 *System availability information point* , which collects and disseminates information concerning the non- availability of telecommunications systems affecting the international automatic and semi-automatic telephone service.

2.1.8 *Circuit control station* , which is responsible for the satisfactory operation of the international circuits that it controls.

2.1.9 *Circuit sub-control station* , which is responsible for the satisfactory operation of the international circuit sections that it controls. It will assist the circuit control station in its work to ensure the satisfactory operation of the entire circuit.

2.1.10 *Restoration control point* , which initiates and coordinates the restoration activities in case of failures or planned outages of transmission systems.

The detailed responsibilities and functions as well as the facilities needed for the elements in §§ 2.1.1-2.1.10 above are described in Recommendations M.715 to M.725.

2.2 *Grouping of basic elements*

It is left to the Administration concerned to decide whether to keep these elements separate or to combine them into one or more maintenance units to suit the particular situation in the country. However, the functions of an individual element should not be divided up between two or more maintenance units.

The elements in § 2.1 above should be grouped in the manner most suitable for a given Administration. The simplest form would combine all the elements into one maintenance unit capable of carrying out all the specified functions. Such an arrangement may be appropriate for those countries where international automatic circuits are few in number. For countries that support larger numbers of international automatic circuits, the functional grouping should be based on the following considerations:

a) the location of testing and measuring facilities;

b) the physical environment of the existing circuit, switching and other equipment;

c) the location of records of circuits, fault reports and service quality;

d) the location and availability of communication facilities;

e) the existence of comparable national functions which might be expanded to include international aspects;

f) the location of national system availability and traffic flow information which should be related to the international automatic network;

g) the level of coordination that is anticipated between elements within the Administration;

h) the staff workload that is anticipated for each element and the potential efficiencies involved in combining elements;

i) the anticipated ability to provide the necessary staff expertise and language facility where needed;

j) the arguments for and against centralization of a given element for an Administration;

k) the availability of supervisory and surveillance facilities at potential maintenance locations;

l) the existence of maintenance units for other services, e.g. leased circuits, having similar maintenance functions;

m) the expected growth in international automatic and semi-automatic services in the country concerned;

n) the expected evolution of the international network;

o) the maintenance requirements and maintenance organization for Signalling System No. 6.

Illustrative examples of possible groupings of maintenance elements are given in Annex A.

Note — The maintenance organization described in this Recommendation does not preclude the use of the terms: international transmission maintenance centre (ITMC), international switching maintenance centre (ISMC) and international service coordination centre (ISCC). Administrations have the freedom to give names to their maintenance units which suit their situation and requirements.

2.3 *Cooperation between maintenance elements*

2.3.1 *Cooperation between maintenance elements within an Administration*

Elements should normally be free to contact each other as required except for any restrictions placed on such contacts by the Administration itself for reasons of efficiency or organization. The information paths and interactions between elements will be influenced by any grouping of elements which an Administration may decide upon — see § 2.2 above.

2.3.2 *Cooperation between maintenance elements in different Administrations*

2.3.2.1 Maintenance elements should primarily communicate with their corresponding elements in other countries. Other channels of communication may also appear necessary or useful under certain circumstances. Figure 1/M.710 illustrates in a matrix, probable communication paths from an originating country to a distant country. It demonstrates the possibility of fault reports, for example, from a number of elements to the distant fault report point (circuit).

Figure 1/M.710, p.

2.3.2.2 Each fault report received by a fault report point should be identified (to include the date and the hour if possible) for reference by all concerned during fault clearance and for informing the reporting element of the disposition of the faults. Fault reports should be accepted by any element performing tests with a distant maintenance element. The element which

accepts the report should always forward it to its appropriate fault report point. The fault report point should give priority to receiving fault reports and initiating fault clearances over all other duties.

2.3.2.3 In addition to the requirements of technical and operational knowledge, the staff responsible for the functions listed in § 2.1 above should be selected and trained with a view to avoiding language difficulties.

The attention of Administrations is also drawn to the benefit that may be derived from enabling staff in the international telephone service who work in corresponding units in different countries to meet and discuss their work.

3 Examples of cooperation between elements

The examples of cooperation indicated in Figures 2/M.710 and 3/M.710 show only simple cases of cooperation between elements.

Figure 2/M.710, p.

4 Cooperation between maintenance elements and network management elements

For definitions of these terms, refer to Recommendation E.413 [1].
Within an Administration, considerable benefits can be obtained from close cooperation and coordination between maintenance elements and network management elements and the network management implementation and control point should be ensured.

Figure 3/M.710, p.

5 Exchange of contact point information

The most important benefit to be derived from defining the maintenance organization as consisting of a number of basic elements is to establish the means whereby those responsible for such elements may be contacted.

For efficient cooperation between maintenance elements in different countries, it is essential that Administrations frequently exchange appropriate contact point information (for example: telephone numbers, telex numbers, service hours, etc.). Reference should be made to Recommendation M.93.

ANNEX A

(to Recommendation M.710)

Illustrative groupings of elements into maintenance units

Note — Network management elements, as defined in Recommendation E.413 [1] may be combined with any of the illustrative maintenance units mentioned in §§ A.1 to A.3 below.

A.1 All maintenance functions performed by a single maintenance unit (see Figure A-1/M.710).

Figure A-1/M.710 [T1.710], p.

A.2 All circuit and equipment testing facilities are at one location (maintenance unit A), while all network and system maintenance aspects are the responsibility of a separate unit (maintenance unit B) (see Figure A-2/M.710).

Figure A-2/M.710 [T2.710], p.

A.3 All circuit matters are the responsibility of a single unit (maintenance unit A), while testing of switching and interregister signalling is performed by staff in the international exchange (maintenance unit B). A separate group of staff have responsibility for network analysis, network fault reports and service restoration (maintenance unit C). System availability functions for the international network are carried out at a location which has similar responsibilities for the national network (maintenance unit D) (see Figure A-3/M.710).

Figure A-3/M.710 [T3.710], p.

Reference

[1] CCITT Recommendation *International network management-Planning* , Vol. II, Rec. E.413.

Recommendation M.711

ESCALATION PROCEDURE

An escalation procedure is the process of referring a matter to an organizational entity with a greater degree of expertise or authority. For persistant maintenance problems the organizational entity will, in the first instance, be the technical service described in Recommendation M.75.

Normally cooperation between maintenance elements in different Administrations, described in § 2.3.2 of Recommendation M.710 will result in the satisfactory identification and correction of faults. There may be circumstances, however, where the fault escalation procedure needs to be used. Generally this will occur when:

— indications of a network malfunction persist despite repeated fault investigations;

— the same fault recurs within short intervals;

— a fault is not cleared or is not likely to be cleared within a reasonable period of time.

In all these cases, the stage at which an Administration will invoke the escalation procedure is a matter for its discretion and will depend on such factors as the severity of the effect of a fault on the service. A network malfunction or fault should not persist for longer than 14 days without the escalation procedure being invoked, unless there are exceptional circumstances.

Subsequent action in the event that the situation is not resolved by the technical service, is for further study.

Note — The period of 14 days is a preliminary value and may be changed after further study.

Recommendation M.715

FAULT REPORT POINT (CIRCUIT)

1 Definition of fault report point (circuit)

The fault report point (circuit) is an element within the general maintenance organization for the international automatic and semi-automatic telephone service at each international centre or common for more than one international centre.

The fault report point (circuit) is equipped with all the necessary facilities and arranged in such a way that it may receive fault reports relating to one or more specifically identified circuits from different sources or make such fault reports to other points and initiate the fault localization and clearing operations.

The fault report point (circuit) will undertake its given responsibilities and functions for circuits provided by wholly analogue transmission and switching systems, and those provided by a mixture of analogue and digital systems.

2 Responsibilities and functions

The fault report point (circuit) is responsible for the following set of functions:

2.1 Receiving fault reports from:

— similar fault report points of other Administrations;

— fault report point (network);

— fault indication functions in repeater stations and the various testing points (e.g. transmission, line signalling, switching and interregister signalling). This can be done manually by the staff, or automatically by automatic supervision functions built into the switching and/or transmission system.

2.2 Recording the fault reports and keeping fault records up to date.

2.3 Performing preliminary diagnosis to determine to which maintenance unit the fault has to be assigned for clearance.

2.4 Initiating detailed fault location and subsequent clearing.

2.5 Sending fault reports as appropriate to:

— circuit control station in its own country in case of controlling end;

— the distant end fault report point (circuit) in case of noncontrolling end;

— the fault report point (network).

2.6 Providing the information and cooperation needed to deal with inquiries by traffic and maintenance staff or by the fault report point (circuit) at the distant end.

2.7 Advising the fault report point (network), the network analysis point, the system availability information point and the network management (implementation and control point) (see Recomendation E.413 [1]) of faults affecting the automatic telephone service as required.

2.8 Requesting the circuit control station within its own country, if controlling end, to arrange for the withdrawal from service of circuits reported faulty.

2.9 Keeping informed of the progress of fault clearance.

2.10 Receiving the information about the cause of the faults.

2.11 Notifying details of fault clearance to the point of origin of a fault report when the fault has been cleared.

2.12 Requesting the circuit control station to arrange for the return of the circuit of service, if controlling end.

2.13 Making or arranging for an analysis of faults as may be necessary.

2.14 Identifying repeated faults and advising the circuit control station.

2.15 Forwarding details of faults found or faults the causes of which could not be found to the network analysis point for analysis to detect long-term trends.

3 Facilities

The fault report point (circuit) should be provided with the following facilities:

3.1 *Service circuits*

Access to various kinds of service circuits, e.g.:

— direct telephone service circuits to relevant contact points within its Administration or to other Administrations in the home country, or in other countries;

— teleprinter circuits;

— telex, teletex, telefax, etc.

3.2 Access to information concerning circuits in service, for instance, by means of data terminals.

3.3 Access to information from the internal and, where provided, external supervisory functions of stored-program control (SPC) exchanges and/or transmission systems, for instance, by means of data terminals.

3.4 Access to manual and automatic maintenance access lines as described in Recommendation O.11 [2].

References

[1] CCITT Recommendation *International network management-Planning* , Vol. II, Rec. E.413.

[2] CCITT Recommendation *Maintenance acces lines* , Vol. IV, Rec. O.11.

Recommendation M.716

FAULT REPORT POINT (NETWORK)

1 Definition of fault report point (network)

The fault report point (network) is an element within the general maintenance organization for the international automatic and semi-automatic telephone service at each international centre or for more than one international centre. If more than one international centre is associated with a given relation, it is desirable to designate one fault report point (network) as the principal one for that relation. If such is not practical, one of the fault report points (network) or a central organization may be nominated to coordinate the activities of the various fault report points (network) that are involved.

Such arrangements provide the maintenance organizations of other Administrations with a single point of contact for directing fault reports and service problems which involve more than one international centre.

While the fault report point (network) is essentially a maintenance element, it will in fact receive reports of network difficulties which may result in network management actions. In other cases, network fault reports may be explained by information already available to the network management (implementation and control point) and collected as a result of its network surveillance responsibility. Therefore, to avoid duplication of report points, considerable benefit is derived from close liaison between the fault report point (network), and the network management (implementation and control point). (See Recommendation E.413 [1]).

The fault report point (network) is equipped with all the necessary facilities and arranged in such a way as to enable it to:

a) receive, from different sources, fault reports of difficulties on the international telephone network or of problems with the international telephone service that, at the time of reporting, cannot be related to specific circuits or, in some cases, even to a specific international centre; and

b) make such fault reports to other points and initiate the fault location and clearing operations.

2 Responsibilities and functions

The fault report point (network) is responsible for the following set of functions:

2.1 Receiving fault reports from:

— similar fault report points of other Administrations;

— traffic operating personnel ;

— customers via the appropriate customer service points;

— service observation staff;

— accounting (charging) analysis service;

— staff at the network analysis point;

— various maintenance centres including information regarding the quantities of equipment or circuits available following a major breakdown;

— telecommunication services concerned with the national network of the country;

— any other source.

2.2 Recording the fault reports and keeping fault records up to date.

2.3 Performing preliminary diagnosis to determine to which maintenance unit the fault has to be assigned for clearance.

2.4 Initiating detailed fault location and subsequent clearing.

2.5 Sending fault reports as appropriate to similar fault report points of other Administrations.

2.6 Providing the information and cooperation needed to deal with inquiries by traffic and maintenance staff or by fault report points of another Administration.

2.7 Advising the network analysis point, the system availability information point and the network management (implementation and control) point (see Recommendation E.413 [1]) of faults affecting the automatic telephone service.

2.8 Arranging where appropriate for the withdrawal from service of faulty equipment and restoral after clearance.

2.9 Keeping informed of the progress of fault clearance.

2.10 Receiving the information about the cause of the faults.

2.11 Notifying details of fault clearance to the point of origin of a fault report when the fault has been cleared.

2.12 Keeping general routing information, diagrams or plans of the arteries relevant to the international network and the national network of the country concerned up to date.

2.13 Making an analysis of faults as may be necessary.

2.14 Identifying repeated faults, and advising the circuit control station.

2.15 Forwarding details of faults found or faults the cause of which could not be detected to the network analysis point for analysis to detect long-term trends.

2.16 Advising all fault report points (network) that may be concerned with changes in the numbering plan of its country together with actions taken to deal with calls to old numbers.

3 Facilities

The fault report point (network) should be provided with the following facilities:

3.1 *Service circuits*

Access to various kinds of service circuits, e.g.:

— direct telephone service circuits to relevant contact points within its Administration or to other Administrations in the home country or in other countries;

— teleprinter circuits;

— telex, teletex, telefacsimile, etc.

3.2 Access to appropriate network information, e.g. number of circuits in service, routing plans, network configuration.

3.3 Access to information from relevant supervisory functions of stored-program controlled (SPC) exchanges and/or transmission systems, for instance, by means of data terminals.

Reference

[1] CCITT Recommendation *International network management-Planning* , Vol. II, Rec. E.413.

Recommendation M.717

TESTING POINT (TRANSMISSION)

1 Definition of testing point (transmission)

The testing point (transmission) is an element within the general maintenance organization for the international automatic and semi-automatic telephone service at each international centre. It carries out transmission testing on international circuits whether provided by wholly analogue transmission and switching systems or by a mixture of analogue and digital systems.

2 Responsibilities and functions

The testing point (transmission) is responsible for the following set of functions:

2.1 Carrying out transmission measurements in connection with the setting-up and lining-up of international circuits.

2.2 Carrying out routine transmission tests.

2.3 Diagnostic testing on receipt of fault indications.

2.4 Passing details of the location of faults to the appropriate maintenance unit and cooperating as necessary in detailed fault localization.

2.5 Advising the circuit control or the sub-control station and the fault report point (circuit) of any difficulties detected by routine tests and the action taken in progressing the clearance of faults.

2.6 Cooperating with staff in other international centres as required.

3 Facilities

The testing point (transmission) should be provided with the following facilities:

3.1 Access to the circuit access point (for definition of these access points, refer to § 2 of Recommendation M.565).

3.2 Access to the line access point (for definition of these access points, refer to § 2 of Recommendation M.565)

In practice, at digital exchanges, a line access point at circuit level may not exist when the exchange is interfaced by primary (or higher order) digital paths.

For digital circuits, reference should be made to Recommendation M.565.

3.3 Test equipment for lining-up, fault localization and routine testing of the following type of circuits:

— analogue;

— mixed analogue/digital;

— digital.

Note 1 — For definition of the circuits, see Recommendation M.560.

Note 2 — Routine tests can be omitted if the supervision functions built into the transmission and switching equipment provide sufficient indication of the overall performance.

3.4 Association of test equipment to the access points so that all transmission parameters specified for the circuits concerned may be measured.

3.5 Communication to the circuit control station and other points concerned with circuit maintenance within the same international centre.

3.6 Communication to similar points in other international centres to which circuits are routed to enable cooperation to be obtained and given.

Recommendation M.718

TESTING POINT (LINE SIGNALLING)

1 Definition of testing point (line signalling)

The testing point (line signalling) is an element within the general maintenance organization for the international automatic and semi-automatic telephone service at each international centre. It carries out line signalling tests on international circuits using channel-associated signalling systems, e.g. R2, No. 5, whether provided by wholly analogue transmission and switching systems or by a mixture of analogue and digital systems

2 Responsibilities and functions

The testing point (line signalling) is responsible for the following set of functions:

2.1 Carrying out line signalling tests in connection with the setting-up and lining-up of international circuits.

2.2 Carrying out routine line signalling tests.

2.3 Carrying out diagnostic tests to localize a reported difficulty in line signalling.

In practice, at digital international exchanges, a line access point at the circuit level may not exist when the exchange is interfaced by primary (or higher order) digital paths. Thus, all signalling testing may

need to be carried out from one location — generally the testing point (switching and interregister signalling). Signalling tests on Signalling Systems No. 6 and No. 7 are controlled and coordinated by the administrative control (see Recommendations M.762 and M.782).

2.4 Passing details of line signalling problems to the appropriate maintenance unit as necessary and cooperating in detailed fault localization.

2.5 Reporting details to the circuit control station, the fault report point (circuit) or the originating fault report point as appropriate of action taken.

2.6 Cooperating with staff in other international centres as required.

3 Facilities

The testing point (line signalling) should be provided with the following facilities:

3.1 Access to the circuit access point (for definition of these access points, refer to § 2 of Recommendation M.565).

3.2 Access to the line access point (for definition of these access points, refer to § 2 of Recommendation M.565).

The line access point can be deleted for circuits with simple terminals. Digital circuits are not provided with line access points.

3.3 Association of test equipment to the access points to assess the performance of the line signalling entities.

3.4 Access to information from the internal and, where provided, external supervisory and testing functions of SPC exchanges , for instance, by means of data terminals.

3.5 Communication with other points concerned with circuit maintenance and signalling equipment maintenance within the same international centre.

3.6 Communication with similar points in other international centres to which circuits are routed to enable cooperation to be obtained and given.

3.7 Access to maintenance access lines as described in Recommendation O.11 [1].

3.8 Access to information from automatic transmission measuring and signalling testing equipment (ATME No. 2) as described in Recommendation O.22 [2].

References

[1] CCITT Recommendation *Maintenance acces lines* , Vol. IV, Rec. O.11.

[2] CCITT Recommendation *CCITT automatic transmission measuring and signalling testing equipment ATME No. 2* , Vol. IV, Rec. O.22.

Recommendation M.719

TESTING POINT (SWITCHING AND INTERREGISTER SIGNALLING)

1 Definition of testing point (switching and interregister signalling)

The testing point (switching and interregister signalling) is an element within the general maintenance organization for the international automatic and semi-automatic telephone service at each international centre. It carries out tests concerned with switching and interregister signalling functions associated with international circuits, whether provided by wholly analogue transmission and switching systems or by a mixture of analogue and digital systems

In practice, at digital international exchanges, a line access point at circuit level may not exist when the exchange is interfaced by primary (or higher order) digital paths. Thus, all signalling testing may need to be

Administrations may organize testing of equipment and functions for common channel signalling systems either at the testing point or at a separate point. Attention is drawn to Recommendation M.762 regarding common channel signalling system maintenance.

carried out from one location, generally the testing point (switching and interregister signalling). This would include line signalling aspects, if any.

2 Responsibilities and functions

The testing point (switching and interregister signalling) is responsible for the following set of functions:

2.1 Carrying out switching and interregister signalling tests in connection with the setting-up and lining-up of international circuits.

2.2 Taking any necessary action as a result of outputs from supervisory and testing functions of SPC exchanges

2.3 Ensuring that new circuits can be accessed via the switching equipment, and that auxiliary equipment (e.g. accounting equipment, ATME) is correctly associated.

2.4 Carrying out routine tests of the switching and interregister signalling entities.

2.5 Diagnostic testing to confirm existence and location of switching and interregister signalling problems indicated by monitorial equipment or fault reports.

2.6 Passing details of the locations of faults to the appropriate maintenance units for clearance and cooperating with them as necessary.

2.7 Advising the fault report point (network) and the network management (implementation and control point) (see Recommendation E.413 [1]) of any problems which may affect service on a route or routes and the action taken.

2.8 Advising the circuit control station of any difficulties detected by routine tests or monitorial means which affect individual circuits.

2.9 Cooperating with staff in other international centres as required.

3 Facilities

The testing point (switching and interregister signalling) should be provided with the following facilities:

3.1 Ability to test common equipment elements for performance and/or availability.

3.2 Access to information from internal or external supervisory testing functions of SPC exchanges.

3.3 Means for assessing switching capability and interregister signalling in accordance with Annex A.

3.4 Communication with other maintenance entities as appropriate.

3.5 Access to maintenance access lines as described in Recommendation O.11 [2].

3.6 For common channel signalling systems, access to information on signalling link status and signalling routing, and from signalling performance monitoring equipment.

ANNEX A

(to Recommendation M.719)

Measuring and testing equipment (signalling and switching)

The basic types of equipment needed by a testing point (switching and interregister signalling) are as follows:

1) equipment for signalling tests;

2) equipment for switching tests;

3) signalling encoders consisting of a signal generator with facilities to vary frequency, amplitude and timing within defined limits, in conjunction with a test call generator, so that test calls using nominal or marginal signals can be generated;

4) signal decoders, i.e. a device capable of responding to incoming signals such as to indicate whether or not the received signals are within limits;

5) signal displays, i.e. a device capable of displaying the signals, line or register, transmitted or received by a circuit. The display should preferably be in digital form;

6) signal timers, i.e. a device capable of measuring the length of signals and the interval between signals (line and register) transmitted or received over a circuit;

7) signal level measuring device;

8) signal distortion measuring device;

9) signal recording device, for permanent records of line and register signals.

Further details of equipment for testing switching and interregister signalling are given in the relevant Recommendations on the different signalling systems.

References

[1] CCITT Recommendation *International network management-Planning* , Vol. II, Rec. E.413.

[2] CCITT Recommendation *Maintenance acces lines* , Vol. IV, Rec. O.11.

Recommendation M.720

NETWORK ANALYSIS POINT

1 Definition of network analysis point

The network analysis point is an element within the general maintenance organization for the international automatic and semi-automatic telephone service associated with one or more international centres.

It receives information concerning service quality and faults not associated with specific circuits.

It analyses all relevant information to investigate the problems involved. The general considerations for checking the quality of the international telephone service are given in Recommendation E.420 [1].

The network analysis point may request the fault report point (network) to initiate investigatory and/or remedial actions in one or more maintenance centres in the home country or via a fault report point (network) in another country. It acts as a single point of contact for general enquiries concerning the day-to-day maintenance of the international telephone network, as may be made by the maintenance organizations of other Administrations.

2 Responsibilities and functions

The network analysis point is responsible for the following set of functions:

2.1 Analysing all fault reports received from the fault report point (network).

2.2 Collecting and analysing all information necessary for the evaluation and supervision of the quality of the international service and the diagnosis and localization of faults reported to it. The following items are recommended for consideration:

a) Call failure information derived from operator and subscriber reports.

b) Traffic service observations for preparation of Tables 1/E.422 [2] and 1/E.423 [3].

c) Traffic service observations undertaken for specific purposes.

d) Results of manual and automatic test calls.

e) Reports from fault report points (network) of other Administrations and also from maintenance units of its own Administration.

f) Summarized information from group reference pilots.

g) Information from automatic supervision of switching equipment.

h) Information that all circuits on a route are busy.

i) Summarized information from traffic monitoring and accounting equipment.

j) Information derived from circuit and circuit group surveillance equipment.

k) Periodic data from traffic measuring equipment, e.g. loading in erlangs, percentage occupancy and overflow intensities.

2.3 Analysing summaries of transmission measurements that may be received from maintenance units of its own Administration.

2.4 Receiving information concerning major breakdowns affecting the international telephone service and evaluating their effect with respect to network condition.

2.5 Receiving reports of all events likely to affect the international telephone service.

2.6 Analysing out-of-service times and cooperating with the maintenance units in their efforts to reduce such times to a minimum.

2.7 Making optimum use of statistical methods (e.g. trouble pattern techniques) for determining the probable location of failure points.

2.8 Cooperation with the network analysis points of other countries in order to coodinate action in case of service defects existing in the part of the network depending on those points.

2.9 Employing information concerning routing, signalling, switching, and transmission systems in its country and other countries to help locate and clear impediments to good service.

2.10 Advising the fault report point (network) of the results of its analyses as necessary.

2.11 Receiving general enquiries concerning the maintenance of the international telephone network from other Administrations, and answering such enquiries or undertaking any necessary analyses or investigations.

3 Facilities

The network analysis point should be provided with the following facilities:

3.1 Appropriate communication facilities in order to assume its responsibilities.

3.2 Access to information from the internal and, where provided, external supervisory and statistical functions of SPC-exchanges , for instance, by means of data terminals.

3.3 Means to receive and process information associated with the functions listed above.

3.4 Means of storing received and processed information.

3.5 Means of accessing stored information.

References

[1] CCITT Recommendation *Checking the quality of the international service* , Vol. II, Rec. E.420.

[2] CCITT Recommendation *Observations on international outgoing telephone calls for quality of service* , Vol. II, Table 1/E.422 of Rec. E.422.

[3] CCITT Recommendation *Observations on traffic set up by operators* , Vol. II, Table 1/E.423 of Rec. E.423.

Recommendation M.721

SYSTEM AVAILABILITY INFORMATION POINT

1 Definition of system availability information point

The system availability information point is an element within the general maintenance organization for the international automatic and semi-automatic telephone service associated with one or more international centres. It collects and disseminates information concerning the non-availability of telecommunications systems which affects the international service. The term availability is used here in the broadest sense of the word.

2 Responsibilities and functions

The system availability information point is responsible for the following set of functions:

2.1 Collecting information concerning major breakdowns, planned outages, or other special circumstances in the *national* and *international* networks which would materially affect international traffic whether incoming, outgoing or transit.

2.2 Keeping aware of the probable duration of major breakdowns and noting whether the relevant traffic load is such that service is likely to be affected.

2.3 Keeping close contact with the restoration control point(s) and assisting in restoration matters.

2.4 Collecting information concerning the status of restoration activities related to major failures, and the return to normal conditions.

2.5 Making available information concerning failures and restoration progress to interested parties and other centres not directly involved in the activities, as appropriate.

2.6 Furnishing reports to the operating authorities of abnormal conditions, as required, including progress reports in connection with prolonged disruptions.

2.7 Furnishing major breakdown information to network management or traffic operating personnel when a major breakdown occurs, so that suitable changes may be made in operating procedures.

2.8 Notifying other international centres as required, through the approriate authorities, of actions taken in connection with major breakdowns.

2.9 Continuously observing system conditions and if a situation arises where service disturbances can be minimized with a change in normal procedures, advising the appropriate maintenance unit (e.g. concerning postponement of a planned outage).

3 Facilities

The system availability information point should be provided with the following facilities:

3.1 Appropriate communication facilities in order to assume its responsibilities.

3.2 Means to receive, store, have access to, and up-date system availability information.

3.3 Access to information concerning the availability of equipment and routes in SPC exchanges , for instance, by means of data terminals.

Recommendation M.722

NETWORK MANAGEMENT POINT

Note — Recommendation M.722 of the CCITT Yellow Book, Fascicle IV.1 contains the definition, functions and responsibilities of a so-called, ''network management point''.

The organization for international network management has now been further developed and is specified in Recommendation E.413 [1].

Reference

[1] CCITT Recommendation *International network management-Planning* , Vol. II, Rec. E.413.

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