PRIVATE MANUAL BRANCH EXCHANGES

Subscribers' Private Metering

*[*NOTE:- As this Instruction has been completely revised, individual paragraphs have not been "starred'. The latest types of P.M.B.X. have now been included and also detailed lists of diagrams and specifications.]*

1 Scope of Instruction. This Instruction outlines the various methods of receiving S.T.D. meter pulses at P.M.B.X.s from the public exchange. Full details of the modifications required to the different types of switchboard will be found in the works specifications and diagrams referred to in the following paragraphs and summarized in Table 3.

2 Facilities offered. A subscriber may be provided with 'trip' metering, 'total' metering or a combination of both. 'Trip' metering provides a record of the charge units registered during one call, the meter being reset to zero by the operator at the end of the call. A switch may be provided to enable the trip meter to be used on more than one line, or on multiple cord-type switchboards a trip meter and an associated metering unit may be connected directly to a selected cord circuit for the same purpose. 'Total' metering provides a cumulative total of all charge units registered on a given exchange line.

3 Types of meter. Two types of meter are used at P.M.B.X.s. The first is the clock-type Meter No. 19 .... as used on D.E.L.s. This meter registers the 'total' and 'trip' readings by means of three hands, one of which can be reset (see Stations, G 3109). The second type of meter has a number-wheel presentation: a Meter No. 150 ... is used for total registration and a Meter No. 21 ... for trip registration. The number-wheel meters are used in conjunction with a metering unit which is required to convert the meter pulses into a form suitable for the operation of these meters.

Three types of metering unit are in use; these are the Metering-Unit No. 1A described in A 1001, and Metering-units Nos. 3A and 3B described in A 1003. The Metering-Unit, No. 1A is obsolescent and is superseded by the Metering-units Nos. 3A and 3B.

The presence of a metering device on an exchange line is not detectable by the exchange test clerk.

4 Meter pulse. The meter pulse is approximately 250 ms in duration at a frequency of 50 Hz and amplitude of 45V r.m.s. The pulse is transmitted longitudinally on the subscriber's line at regular intervals throughout the duration of the call, the intervals between the pulses being determined by the charging rate for the call.

Fig. 1 shows for explanatory purposes the method of injection and reception of the meter pulse.

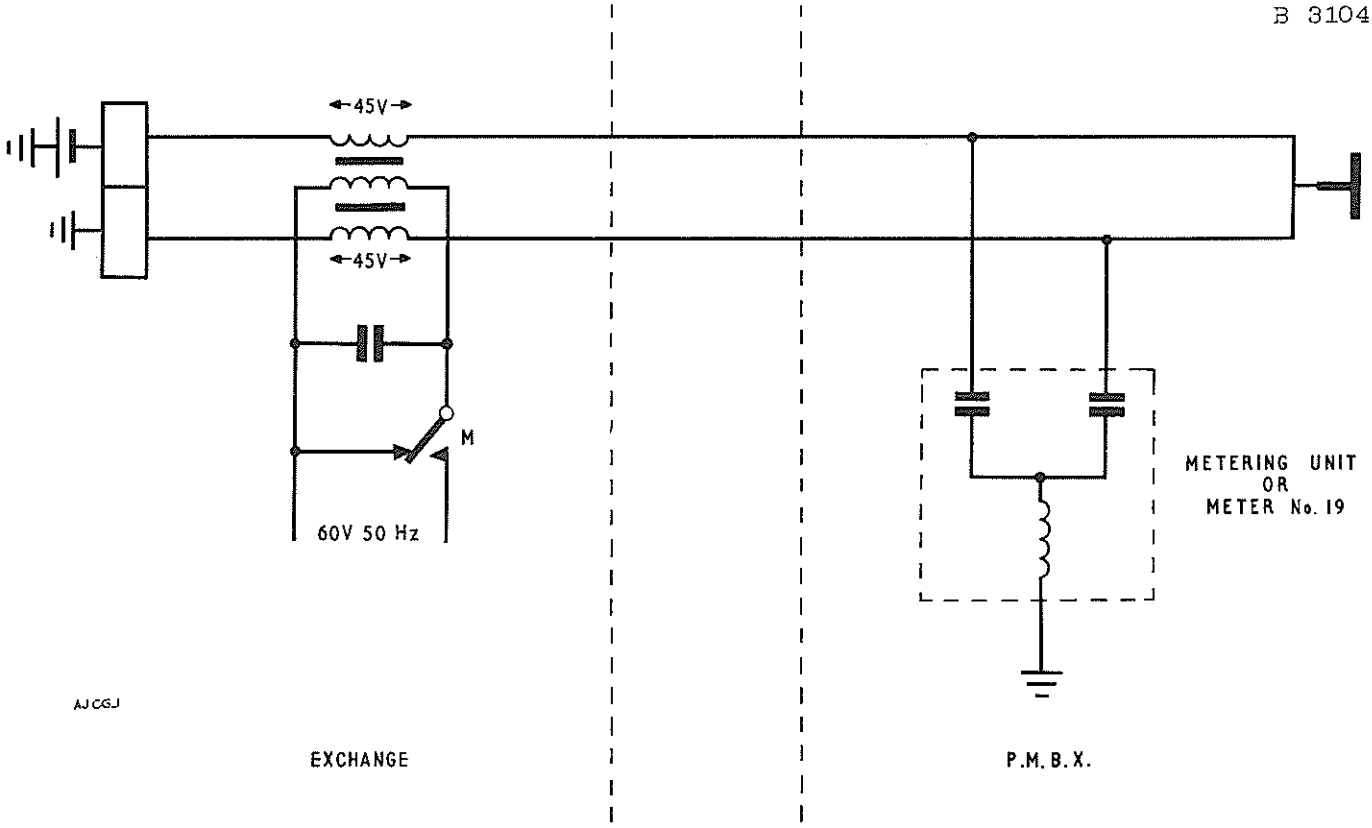

FIG. 1

5 **Metering schemes.** For ease of reference the various combinations of trip and total metering are coded as shown in Table 1. This code will be referred to in other Instructions, diagrams etc.

The scheme to be used at any particular installation will be determined by the subscriber's requirements. Where more than one scheme will meet his needs then the scheme which uses the least number of metering units should be provided.

6 Metering at cordless P.M.B.X.s.

(a) Switchboards, P.M.B.X.s. Nos. 2/2A and 2/2B. Schemes C1(b) or D1 may be provided at these installations using Meters No. 19 ..... For Scheme D1 the meters should be mounted on a Baseboard No. 41A which accommodates one meter.

The provision of metering to Scheme C1(b) entails the use of a Switching-unit No. 6 to which a Meter No. 19 is connected and fixed.

Full details of the provision of these facilities are given in Dgms. N 1003 and N 1004.

(b) *Switchboards, P.M.B.X., Nos. 2/3A, 2/4A, 3/3B and 3/5B* - Schemes A, B, C1 *(a)*, C2, D1 and D2, using Metering-units No. 3B and Meters No. 21B and 150C are available for these installations. When Scheme A is provided the totals meters may be accommodated within the Metering-unit No. 3B; trip meters for Scheme B should be fitted on the P.M.B.X. in the mounting space provided.

Provision is also made on the P.M.B.X. to accommodate a switching device which will be used when Schemes C1*(a)*, C2 or D2 are to be provided. Full details on the provision of any of the above facilities are contained in Dgm. N 1005.

7 Metering at non-multiple cord-type P.M.B.X.s. Schemes A, B, C1*(a)*, C2, D1 and D2 may be provided. Metering-units should be used together with trip or totals meters (or both) according to the scheme required.

For switched metering schemes a Switch, Rotary, CD 5022 is used. Details of typical connexions to this switch are given on Dgm. N 1010.

The trip meters and associated switches are mounted in a Case No. 24 secured to the side of the switchboard at a convenient level for the operator. By the use of alternative mounting plates a Case No. 24 will accommodate either a maximum of five meters or a maximum of two switches and two meters for switched trip metering. A Mounting D91548 is used when meters only are to be housed and a Mounting D91549 is used when switches and meters are to be accommodated.

TABLE 1

Scheme	Type of metering
A	Total metering on exchange lines
B	Straightforward trip metering (i.e. each trip meter and metering unit permanently associated with an exchange line)
C	Switched trip metering, the trip meter being switched as indicated in C1 or C2:-
	C1*(a)* Trip meter permanently connected to a metering unit, the whole being switchable to the required exchange line
	C1*(b)* A Meter No. 19 capable of being switched to the required echange line
	C2 A trip meter switchable to one of a group of metering units, each metering unit being permanently connected to an exchange line
D	Total and trip metering combined as in D1 or D2:-
	D1 Combination of Schemes A and B
	D2 Combination of Schemes A and C2

Scheme	Type of metering
E	Extension Metering. (Totals and/or trip) (a) Localized. Usually provided by a Meter No. 19 ... connected at the extension telephones. (b) Centralized. Usually provided by a metering unit and Meters No. 21 ... and/or No. 150 ...
F	Cord circuit trip metering. A metering unit and trip meter may be permanently associated with each of selected cord circuits, trip metering then being provided on exchange calls using those cord circuits.

Normally the Case No. 24 should be mounted on the right-hand side of the switchboard.

Where more than five meters (for Scheme B) are required a second Case No. 24 should be provided. When switched trip metering is to be provided, not more than two meters should be provided on each switchboard. Spare postions in the mountings should be blanked out with Meters, Dummy, No. 2 or Labels, Dummy, No. 1 as required. Dgms. N 1011 and N 1012 refer.

For totals metering, when Metering-units No. 3A are used, totals meters should be mounted in the space provided within each metering unit.

Full details on the provision of metering facilities at non-multiple P.M.B.X.s will be found on Works Specn. S 595 and Dgms. N 1011, N 1012, N 1013, N 1021, N 1022 and N 1023.

8 Metering at multiple P.M.B.X.s. Totals metering may be provided on exchange lines terminating on multiple-type P.M.B.X.s. Trip metering when required should be provided by cord circuit metering except where the subscriber specifically requests switched trip metering when schemes C1*(a)* or C2 should be provided. For cord circuit metering a trip meter is permanently associated with the cord circuit, being operated by a metering-unit associated with either the cord circuit or the exchange line.

The trip meters are mounted in the face equipment of the switchboard on a Mounting D 91550. Each mounting can accommodate up to five meters. Any number of cord circuits can be equipped for metering but normally not more than five per position will be required. These should be provided on the odd numbered cord circuits commencing at cord circuit No. 1. Cord circuits with metering facilities should have a grey plug cover fitted. Full details on the provision of cord circuit metering at the various types of multiple P.M.B.X. installation are given in the works specifications and diagrams listed below:-

B.E., C.B., No. 9 installations:-
Works Specn. S(W)2011
Dgm. N 1031
B.E., C.B., No. 10 installations:-
Works Specn. S(W)2012

Dgms. N 1032, SA 7300/0, SA 7300/1,
SA 7302, SA 7304, SA 7311,
SA 7312, SA 7314, SA 7321,
SA 7322, SA 7323, SA 7324,
SA 7325, SA 7326

P.M.B.X.s Nos. 1A and 1B installations:-
Works Specn. S(W) 2010
Dgm. N 1030

P.M.B.X. No. 4/1A installations:-
Dgm. N 2250

Where totals metering is required at any multiple-type P.M.B.X. it should be provided as indicated in par. 7, except that at B.E., C.B., No. 10 installations a Resistor, Coil, No. 9, 350Ω should be fitted in series with each meter.

9 Extension metering. This may be provided by fitting a Meter No. 19 at extensions connected to "through clearing' P.M.B.X.s. Details are given in Works Specn. S 599.

10 Power supplies. It is essential that a good earth connexion be provided at all installations fitted with subscribers' private meters.

To ensure satisfactory operation of the meters at P.M.B.X. installations it is necessary that the supply voltage should not fall below the minimum voltage required to operate the meters or metering units. Minimum voltages are as follows:-

Meter No. 21A	20V
Meter No. 21B	45V
Metering-unit No. 3A	20V
Metering-unit No. 3B	45V

A 50Hz ringing supply should not be used at P.M.B.X.s equipped with subscribers' private metering facilities (see POWER, General, S 3801).

11 Noise suppression. To minimize noise during the receipt of meter pulses the metering units have been designed so that the metering current is not more than 1.0 mA (0.5 mA on each leg of the line). However, under certain conditions in P.M.B.X. working a relatively low impedance to earth is presented to the meter signal by the P.M.B.X. equipment. This causes a high current to be drawn during metering which makes the meter pulse audible due to imbalance in the circuit. In extreme circumstances the metering device may fail to operate and a very loud noise will be heard in the operator's and/or extension telephone associated with the line.

These difficulties and the action to be taken to overcome them are described in B 3105 and B 3106.

12 Labelling. All equipment to provide metering facilities at P.M.B.X.s (with the exception of the meter provided for Scheme C1*(b)* for which a label is not required) should be labelled as indicated in Table 2.

TABLE 2

Equipment	Label No.	Marking
Meter No. 19	319	Exchange line appearance (i.e. 1, 2 or 3)
Switch, Rotary, CD 5022	359A 359B 359C	1-10 11-20 21-30
Case No. 24 (housing meters for Scheme B)	361A 361B 361C 361D	1-5 6-10 11-15 16-20
Meter No. 150 ...	Part No. 1/DLA/21	Exchange line number
Mounting D 91550 (for trip meters when cord circuit metering is provided)	399A 399	1, 3, 5, 7, 9 as required
Exchange line jacks:- Switchboards CB 873, $\frac{5 + 20}{25}$	362	1-5
Switchboards AT 3796 and N 1070 $\frac{10 + 30}{65}$, $\frac{10 + 50}{65}$	363A 363B	1-10 11-20
$\frac{10 + 60}{180}$	364A 364B	1-10 11-20
Section, Switch, B.E., C.B., No. 9 and No. 10 P.B.X., SA 7560 P.M.B.X.s Nos. 1A and 1B	364A 364B 364C	1-10 11-20 21-30
Exchange line lamps:- Swbd. P.M.B.X. No. 2/3A	Strip, Designation, No. 33 complete	As required
Swbd. P.M.B.X. No. 2/4A	Strip, Designation, No. 34A complete Strip, Designation, No. 35A complete	
P.M.B.X. No. 3/3B	Strip, Designation, No. 33 complete	
P.M.B.X. No. 3/5B	Strip, Designation, No. 38A complete	

TABLE 3. LIST OF DIAGRAMS AND SPECIFICATIONS FOR S.T.D. METERING

Type of P.M.B.X.	Facilities offered	Works specification	Diagrams
Swbd. P.M.B.X.s Nos. 2/2A and 2/2B	Scheme C1(b) Scheme D1	– –	N 1004 N 1003
Swbd. P.M.B.X. No. 2/3A	Schemes A, B, D1, C & D2	–	N 1005
Swbd. P.M.B.X. No. 2/4A	Schemes A, B, D1, C & D2	–	N 1005
P.M.B.X. No. 3/3B	Schemes A, B, D1, C1, C2 & D2	–	N 1005
P.M.B.X. No. 3/5B	Schemes A, B, D1, C1, C2 & O2	–	N 1005
P.M.B.X. No. 4/1A	All Schemes	–	N 2250
Swbd. CB 873, $\frac{5 + 20}{25}$	Schemes A, B & D1 Scheme C1 Schemes C2 & O2	S 595 S 595	N 1021, N 1011, N 1013 N 1022, N 1012 N 1023, N 1012
Swbds. AT 3796 and N 1070 $\frac{10 + 30}{65}$, $\frac{10 + 50}{65}$, $\frac{10 + 60}{180}$	Schemes A, B & D1 Scheme C1 Schemes C2 and D2	S 595 S 595 S 595	N 1021, N 1011, N 1013 N 1022, N 1012 N 1023, N 1012
Section, Switch, B.E., C.B., No. 9	Cord circuit metering Scheme A Scheme C1 Schemes C2 & D2	S(W) 2011 S 596 S 596 S 596	N 1031 N 1035, N 1013 N 1036, N 1014 N 1037, N 1013, N 1014
Sections, Switch, P.M.B.X.s Nos. 1A and 1B and P.B.X. SA 7560	Cord circuit metering Scheme A Scheme C1 Schemes C2 & D2	S(W) 2010 S 596 S 596 S 596	N 1030 N 1035, N 1013 N 1036, N 1014 N 1037, N 1013, N 1014
Section, Switch, B.E., C.B., No. 10	Cord circuit metering Scheme A Scheme C1 Schemes C2 & D2	S(W) 2012 S 596 S 596 S 596	N 1032, SA 7300/0, SA 7300/1, SA 7302, SA 7304, SA 7311, SA 7312, SA 7314, SA 7321, SA 7322, SA 7323, SA 7324, SA 7325, SA 7326 N 1035, N 1013 N 1036, N 1014 N 1037, N 1013, N 1014

References:- A 1003, B 3105, B3106
(FD.2.4.1.) Stations, G 3109
POWER, General, S 3801

E N D