NEW ZEALAND POST OFFICE

ENGINEERING REPORT

ER/TP 1048

BASIS OF DESIGN : N.Z. UNIT TYPE AUTOMATIC EXCHANGE SYSTEMS

ENGINEER-IN-CHIEF'S OFFICE
GENERAL POST OFFICE
WELLINGTON

(FOR OFFICIAL USE ONLY)

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This Report indicates the Basis of Design for NZPO UAX systems and supersedes information contained in Technical Report 1048.

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1. SCOPE

1.1 Because of the many changes that have taken place in detailed equipment design and also the subscribers' tariff structure since TR 1048 and subsequent addenda were issued, further addenda cannot easily clarify the position as described in that document.

1.2 This new document ER/TP 1048 therefore replaces TR 1048 for virtually all new work. TR 1048 does, however, contain information of historical interest and may therefore provide background information of some value with respect to the design of some of the older UAX installations.

1.3 All reference to the Basic Design Data has been deleted. This is now to be covered by appropriate Engineering Instructions.

2. THE UAX - GENERAL DESCRIPTION

2.1 NZPO Version of UAX

2.1.1 The UAX system is basically the UAX No.13 system as described in Atkinson's "Telephony" Volume 2.

2.1.2 To suit N.Z. conditions, a number of additional items of equipment have been designed to provide for party line service in rural areas. In addition, the junction relay set circuits have undergone considerable change over the years to meet specific NZPO requirements.

2.2 Subscriber Service The UAX will provide for the following types of service :-

(a) Individual (I)

(b) PBX (X)

(c) CCB (C)

(d) Two-party (P and S), see para. 3.

(e) Multi-party (R and M), see para. 4.

2.3 UAX Equipment and Numbering Scheme Capacity

2.3.1 The UAX system is designed for a 3-digit closed numbering scheme. First digits 0, 1, 2 and 9 are normally reserved for junction and revertive relay set access which limits the maximum subscriber capacity to 600.

2.3.2 In special cases, some UAX's have been installed with greater capacity, or with linked numbering schemes, but prior approval of the Engineer-in-Chief is necessary before any such projects are planned.

2.3.3 Accordingly, all new UAX projects and extensions should be based on a maximum capacity of 600 numbers inclusive of all individual and party lines.

2.4 Numbering Allocations

2.4.1 The rules to be observed in allotting new numbers for UAX systems are given on sheets 12 and 13 of the Number Allocation Chart NZPO Drg 24593.

2.4.2 Sheets 1 to 9 of these charts, besides clarifying the manner in which these rules should be applied, are also to serve as a number allocation register for each system on which to record brief particulars of the subscriber's name, classification, associated line circuit number, 'M' or 'R' relay set number or 'M' junction number.

2.4.3 The appropriate sheets as required for each new UAX system should be ordered as required and bound into a suitable folder locally.

2.4.4 For numbers unallotable to subscribers, see para. 4.8 & 18.4.

2.5 The General Construction and Name of Units

2.5.1 The UAX is designed for use in unheated buildings and hence, to protect the equipment from varying atmospheric conditions, it is totally enclosed in air tight units. For identification purposes, each type of UAX unit is designated as follows :-

N.Z. 13A	Unit or simply the A-unit
N.Z. 13B	Unit or simply the B-unit
N.Z. 13C	Unit or simply the C-unit
N.Z. 13M	Unit or simply the M-unit
N.Z. 13R	Unit or simply the R-unit
N.Z. 13S	Unit or simply the S-unit
N.Z. 13E	Unit or simply the E-unit
N.Z. 13RM	Unit or simply the RM-unit
N.Z. 13RR	Unit or simply the RR-unit

2.5.2 Various combinations of these units may be used to form a self-contained UAX with the A, R, RM and RR-units as the basic subscribers units.

2.5.3 The quantities of the various items of equipment to be provided for each installation are to be in accordance with the Basis of Provision ER/TP 1054 for the forecast subscriber demand and junction traffic applicable to the agreed provision period.

2.5.4 Whenever possible, building construction and in some cases complete installation and wiring of equipment is carried out at some convenient locality prior to transportation to site (see para 2.1 of IS 1130).

2.6 Emergency Service and Other Special Services

2.6.1 Where applicable, access will be given via digits '111' to Emergency Service. It should be noted that if there is any possibility of the service authorities being able to provide for such a service from cut-over, full facility signalling is to be provided (see para 26.2). However, for a new UAX the provision of full facility signalling and Emergency '111' service may be deferred in accordance with para 26.2 (c).

NOTE Where Emergency '111' service is provided at the Group Centre but not at an existing UAX, the provision of facilities for the introduction of Emergency '111' service at the UAX should be revised when planning subsequent extensions to the UAX.

2.6.2 Access to other Special Services is as follows :-

(a) At message-rate UAX's without full facility signalling, subscribers dial '0' and request the desired service.

(b) At flat-rate UAX's subscribers normally gain direct dialled access to special service numbers.

(c) At message-rate UAX's equipped with full facility junction signalling, where parent equipment permits and access to '111' is required, direct dialled access to other special service numbers should be provided.

2.6.3 Whenever direct dialled access to special service numbers by UAX subscribers is first introduced in a Toll Group, particular care should be taken to ensure that correct relay set facilities for both parent exchange and intermediate exchanges are provided - i.e.,

(a) Reversal on answer for all special service calls.

(b) In addition to the reversal in (a) above, for calls to special service numbers other than '0' or '111', provision of release and re-busy facilities.

(c) The entry loop conductor resistance of all special service terminating relay sets must be at least 1800 ohms and preferably 2000 ohms (see Drwg NZPO 31490).

2.7 Subscriber Signalling and Transmission Limits. (See E.I. TRANS Teles B 3502, E.I. TELES Gen I 3000 and E.I. TRANS Teles C 3000).

(a) For 'I', 'X', 'C', 'P', 'S' and 'M' Subscribers :-

(i) Loop dialling with a maximum DC loop resistance of 1000 ohms.

(ii) The insulation resistance must not be less than 50,000 ohms from wire to wire or from either wire to earth.

(iii) Central battery transmission with a maximum line attenuation and penalties of 10dB.

NOTE Loop ringing to 'I', 'X' and 'C' subscribers; selective earthed ringing to 'S' and 'P' subscribers (maximum subscribers earth resistance of 500 ohms); non-selective loop ringing to 'M' subscribers on a code basis with up to five subscribers per line.

(b) For 'R' Subscribers :-

(i) Simplex dialling with a maximum conductor resistance of the signalling path (i.e., both wires of the line in parallel plus the earth resistance at the subscriber's premises) not exceeding 750 ohms.

(ii) The insulation resistance of the signalling path (i.e., between the wires of the line in parallel and earth) must not be less that 5000 ohms.

(iii) Local battery transmission in accordance with E.I. TRANS Teles C 3000 para 15.

(iv) Non-selective loop ringing on a code basis with a maximum of 10 subscribers per line.

2.8 Voltage Limits and Power Provision. (See E.I. POWER Gen F 3401, Drwg NZPO 29314 and Section 11 of ER/TP 1054.)

2.8.1 The UAX equipment is designed to work with a standard voltage of 50 volts negative maintained over limits of 46 to 53 volts. Where AC mains supply is available, a single 24 cell 50 volt negative secondary battery is provided floated by means of one or more rectifiers dependant on the UAX load. Normally no provision is made for standby power, and, in the event of mains failure, dependence is placed on the battery capacity to maintain the voltage within working limits for the duration of the power break.

2.8.2 A 34 cell 50 volt positive primary battery is also provided to cater for trunk offering and route unbarring.

3. TWO-PARTY AND SHARED SERVICE LINES.

3.1 Two methods are available for providing two-party service at UAX's. To discriminate between the two, one has been called 'two-party (P)' and the other 'shared-service (S)'.

3.2 Shared-service (i.e., one line circuit per subscriber) is only to be used where STD facilities exist. In all other cases two-party service (i.e., one line circuit per two-party line) is to be used. This arrangement is to be applied retrospectively to existing non-metered UAX's and the subscribers' instruments standardised accordingly.

4. MULTI-PARTY LINES.

4.1 In areas where for economic reasons and rental reasons individual or two-party service cannot immediately be contemplated, multi-party lines are provided.

4.2 Multi-party equipment of either 'M' or 'R' type can be provided in the UAX for this purpose, but prior approval of the Engineer-in-Chief is necessary before 'R' type service can be planned or implemented.

4.3 'M' service provides loop dialling, central battery transmission feed and non-selective loop code ringing for a maximum of five subscribers per line. Line insulation resistance, loop resistance and attenuation limits for individual and two-party lines detailed in para. 2.7 (a) also apply to 'M' lines.

4.4 'R' service provides simplex dialling, local battery transmission feed and non-selective code ringing for a maximum of 10 subscribers per line. Line insulation resistance, loop resistance and attenuation limits are detailed in para. 2.7 (b).

4.5 Details of the 'M' and 'R' type equipment are described in para. 11 - 15 inclusive.

4.6 The ringing code sent to line for 'M' or 'R' lines can be decided by either the penultimate or the last digit of the subscribers number and depends on the type multi-party equipment installed at the UAX. The different methods used for ringing are shown in the following table :-

System	Ringing Codes Used	Digit used to apply code	Type of Ringing
R & RR-unit	X A D J K M R S U W 0 1 2 3 4 5 6 7 8 9	Penultimate	75V/90V AC 25 c/s
M & RM-unit	A D M R S 1 2 3 4 5 6 7 8 9 0	Penultimate	120V/140V AC 25 c/s
5-Pty R & M Relay Set	A D M R S (can be any digit; but preferably digits 1 2 3 4 5 respectively)	Last	120V/140V AC 25 c/s
10-Pty R Relay Set	X A D J K M R S U W (can be any digit; but preferably digits 0 1 2 3 4 5 6 7 8 9 respectively)	Last	120V/140V AC 25 c/s

4.7 Revertive calls by 'R' subscribers are made by code ringing on the hand generator associated with each subscriber's telephone instrument.

4.8 Revertive calling between 'M' subscribers is achieved automatically by dialling special revertive numbers as follows :-

Subscriber	Code	Revertive No.
A	B CCC	991
D	CCC B B	992
M	CCC CCC	993
R	B CCC B	994
S	B B B	995

5. MULTI-PARTY INSTRUMENTS

5.1 The standard 300-type rural automatic telephone is installed for all 'R' subscribers and either a 300- or 700-type installed for 'M' subscribers.

5.2 The standard transmission and signalling characteristics are achieved for 'M' lines by the fitting of a cold cathode tube in series with the bell coils of each telephone instrument.

5.3 The installation of cold cathode tubes in 'M' subscribers' telephones necessitates the use of high voltage ringing (120V/140V) to ensure reliable operation. Consequently the ringers at the UAX that supply the ringing current to 'M' subscribers lines have been designed to give the higher voltage.

6. N.Z. 13 A-UNIT - GENERAL DESCRIPTION.

6.1 The A-unit is a single cabinet local switching unit equipped with subscribers' line circuit, line finders, group selectors and final selectors together with subscribers' meters if necessary.

6.2 It has a normal capacity of 50 subscribers' line circuits except in the case covered in para. 14.4 and can serve all types of subscribers (i.e., 'I', 'X', 'C', 'S', 'P', 'R' and 'M').

6.3 The links and final selectors comprise of 100 outlet, 2-motion and 2000-type selector mechanisms. All other miscellaneous switches are of the uniselector type. (A link consists of a line finder and its associated group selector.)

7. N.Z. 13 C-UNIT - GENERAL DESCRIPTION.

7.1 The C-unit is a single cabinet common equipment unit containing MDF, IDF, Line Tester and relay sets to supply ringing, tones, pulses and alarms.

7.2 The line side of the MDF can terminate a maximum of 320 underground cable pairs on 20-pair fuse mountings - i.e., inclusive of subscribers' lines and junctions, or a proportionately larger number if other types of fuse mountings such as 25-pair or 40-pair types are equipped.

7.3 Additional C-units are not to be installed merely to provide additional line side terminations. Should a situation arise where insufficient line side terminations are available despite the use of 40-pair fuse mountings, consideration should be given to the possibility of installing a wall type MDF.

7.4 The exchange side of the MDF has provision for terminating 200 subscribers' numbers plus two 20-pair protector mountings which may be used to terminate either junctions or multi-party lines (see para. 16.).

8. N.Z. 13 B-UNIT - GENERAL DESCRIPTION

8.1 B-units are used to accommodate junction and multi-party relay sets and, in some cases, groups selectors (see para. 9.2).

8.2 These units are equipped with fuse panels, an alarm relay and a miscellaneous terminal strip.

8.3 The basic B-unit includes no other equipment, but the relay plate supports are drilled to accommodate twenty nine 10 x 2 BPO No. F 151/20AH mounting plates. The same B-unit drilling's can be used for other types of mounting plates provided suitable adapter brackets are equipped.

8.4 The number of relay sets that can be installed in a B-unit will depend on the type and size of relay sets required.

9. N.Z. 13 E-UNIT AND E-UNIT SHELVES - GENERAL DESCRIPTION.

9.1 An E-unit has the same dimensions as a B-unit and is widely used to accommodate two-motion group selectors. Accommodation is available for five selector shelves each with provision for five group selectors - i.e., group selector capacity of an E-unit is 25 group selectors.

9.2 In order to provide greater flexibility and more efficient utilisation of unit space, selector shelves fitted in E-units can also be equipped as required in B-units. This arrangement is generally to be followed in preference to the use of E-units, and the B-units may be equipped with both relay sets and group selector shelves. Group selector shelves used in this way are commonly termed E-unit shelves.

9.3 E-units or E-unit shelves are used in the following circumstances :-

(a) As a means of overcoming link congestion at UAX's with a high calling rate by connecting all or early choice incoming junctions direct onto group selectors.

(b) As a means of providing junction tandem switching facilities for a number of adjacent UAX's.

10. N.Z. 13 S-UNIT - GENERAL DESCRIPTION.

10.1 An S-unit has a B-unit type cabinet and can be installed at a UAX to accommodate AC3 signalling equipment.

10.2 There are two basic types of S-units, a Group 1 and a Group 2. The Group 1 unit contains the common equipment - e.g., oscillators, etc., in addition to the junction equipment. The Group 2 unit contains junction equipment only. These units were originally designed for valve type AC3 signalling equipment but the later versions now being ordered are specifically designed for the transistorised equipment which supersedes it.

10.3 The equipment installed in each type of unit and capacity of each type is as shown in Appendix No. 1.

11. N.Z. 13 R- & RR-UNITS - GENERAL DESCRIPTION

11.1 It normally serves up to five parties per line. In exceptional cases, two line circuits can be multipled together to serve a 6- to 10-party line. The maximum number of lines which it is possible to connect to any R-unit is 20 (reduced by the number of multipled line circuits) and the maximum number of subscribers is 100.

11.2 The line finders, discriminating selectors, final selectors and all miscellaneous switches are of the uniselector type.

11.3 R-units usually depend for their working on the parent A-units. However, a call between two subscribers on the same R-unit releases the parent A-unit equipment as soon as the first digit is dialled. A call between two subscribers on different R-units however uses the parent A-unit equipment throughout the conversation.

11.4 R-units may either be installed in a UAX building (attached R-units) or installed in a separate building as individual switching units (RR-units) remote from the parent UAX or other type of parent exchange. Economic considerations usually govern the provision of these RR-units (see ER/TP 1054 para. 8.3).

11.5 The main use for R-unit equipment in the future will be for remote M-unit applications (see ER/TP 1054 Section 8).

11.6 Incoming junctions from an attached R-unit can either be terminated on a special relay set connected to levels 8 and 9 of the line finders or to a subscriber's line circuit (see ER/TP 1054 para 4.7.19).

NOTE :-

(a) Spare line circuits will be available at non-metering UAX's where two-party line service is provided.

(b) Direct connection is used between the A-unit group selector levels and the R-unit final selectors when the R-unit is attached.

12. 'R' RELAY SETS - GENERAL DESCRIPTION.

12.1 There are two types of 'R' relay sets, one to serve two to five subscribers and the other to serve six to ten subscribers.

NOTE :- An NZPO 'R'-line adapter circuit has also been designed to enable a one- to five-party 'R'-line to be connected to an M-unit or remote M-unit. It can also be used to connect a single 'R' subscriber to an A-unit subscribers' number and line circuit.

12.2 Both types of relay sets have been designed along similar lines to the 'M' relay set. They are B-unit mounted and use one A-unit subscriber's line circuit.

12.3 For terminating calls any A-unit final selector numbers may be used. If possible numbers ending in 1, 2, 3, 4 and 5 are preferred for each 1- to 5-party 'R' relay set and numbers ending in 0 to 9 for each 6- to 10-party 'R' relay set. On receipt of a call to any of these numbers, the appropriate code ring will be transmitted to line.

13. 'M' RELAY SETS - GENERAL DESCRIPTION.

13.1 The 'M' relay set is B-unit mounted and utilises A-unit final selector numbers. One A-unit number per subscriber served on the multi-party line is allocated and grouped on the 'M' line relay set. The particular number dialled by another subscriber calling an 'M' line subscriber determines the ringing code sent to line.

13.2 One A-unit line circuit is allocated per 'M' line relay set and is connected to the line finder in the normal manner at non-metering UAX's. At metering UAX's the line circuit is connected to line finder levels 2 or 3 so that access to STD routes can be barred.

14. N.Z. 13 M-UNIT - GENERAL DESCRIPTION.

14.1 This equipment is assembled in a B-unit type cabinet and comprises up to eight multi-party uniselector-type final selectors which are cabled from a level of the UAX group selectors. These 'M' subscribers will thus be included in the UAX numbering scheme - e.g., if connected to level 5 the number series will be 500 - 599 (see sheet 7 of Number Allocation Chart No. 24593).

14.2 A maximum of 20 'M' lines may be served from the M-unit with a maximum of five subscribers per line.

NOTE - Unlike the R-unit two lines cannot be grouped under any circumstances to form a 10-party line.

14.3 For outcalling, the 20 lines of the M-unit are cross-connected to 20 line circuits in the A-units. At metering UAX's the line circuits are those connected to either levels 0, 2 or 3 of the line finders. The normal post springs of the line finders are arranged to operate in order to bar access from 'M' subscribers to metered routes. At non-metering UAX's any line circuit except those connected to level 2 of the line finders can be used for 'M' lines.

14.4 Spare line circuits within the normal capacity of the 50 per A-unit are to be used, provided that this does not make it necessary to install an additional A-unit within the provision period. This applies to both initial installations and to extensions. If additional A-units are required, or if there are insufficient spare line circuits spare circuits available, then an additional 10 line circuits per A-unit (i.e., 60 line circuits), terminated on level 0 of the line finders, may be installed to meet the M-unit requirements. In this way the full capacity of the A-unit final selector multiple may be allocated to subscribers provided that the overall traffic capacity (3.11E) of the line finders and group selectors (links) is not exceeded (see also para. 22.8).

14.5 When deciding whether an M-unit or M-line relay sets should be provided, the following considerations apply :-

(a) The maximum number of 'M' lines/subscribers to be served within the provision period under consideration and also the long term forecast.

(b) Any upgrading of 'M' lines to individual or 2-party which is likely to occur in the near future and consequent number changes, etc which may result.

(c) The relative economics of providing M-unit or M-line relay sets must take into account any need for an additional A-unit that may be necessary to provide sufficient A-unit final multiple for M-line relay sets.

(d) At extensions, any existing M-line equipment that may already be provided.

(e) As a rule it is generally more economic to provide an M-unit where more than 25 'M' subscribers are to be served.

15. N.Z. 13 RM-UNIT (REMOTE 'M') - GENERAL DESCRIPTION.

15.1 This is an R-unit modified to give 'M' service. The basic design in regard to the method of switching and trunking is retained and the capacity remains at 20 lines/100 subscribers maximum (19/95 if AC3 or rural carrier is used on junctions to the group centre). However, two lines cannot be grouped together as for R-unit working to form a 10-party line.

15.2 Revertive calling is by means of revertive relay sets, GBW 13770 and uses the standard codes listed in para 4.8. It is necessary to install these relay sets in a B-unit as there is insufficient room in the RM-unit.

16. MDF JUNCTION TERMINATIONS.

16.1 A UAX of up to 200 lines (one C-unit) will rarely, if ever, require more than 20 junctions and these will be terminated on the first junction protector block on the C-unit MDF. In exchanges of this size, the second junction protector block on the MDF can be installed to terminate any 'M' or 'R' relay sets, the line circuits from a local R-unit, or the line multiple from an M-unit.

16.2 Exchanges with more than one C-unit will have space available for two additional junction protector blocks per C-unit to be installed for the connection of junctions, etc., as detailed in para. 16.1 above.

16.3 Protectors corresponding to A-unit numbers which are grouped onto 'M' or 'R' relay sets must have the heat coils removed and should be identified by means of sleeves over the test springs.

16.4 The absence of the heat coils and the presence of marking sleeves will :-

(a) serve to indicate to visiting Line, Fault and Technicians staffs that although not jumpered on the MDF these numbers are in use.

(b) serve to indicate to these staffs that these numbers are grouped on 'M' or 'R' relay sets.

(c) safeguard against accidental faults being applied at the MDF.

17. LINE TEST SETS

17.1 For testing CB and LB lines, UAX systems are invariably equipped with a line test panel (GBW 13871) mounted in each C-unit. Only one line test panel is required, and where more than one C-unit is installed at a UAX, the line test panels in the additional C-units will be spare. For testing subscribers lines at a remote R-unit, a separate testing cabinet, GBW 13710 is supplied. A testing cabinet GBW 13710 MOD A is supplied for use at a remote M-unit.

18. ALARMS AND FAULTS.

18.1 Alarms at the UAX are not extended automatically, but are checked by routine calls initiated by the parent Group Centre operator or technician five time a day to UAX test numbers. (See E.I. TELS Auto H 5211).

Note The standard NC230ZA Alarm Sender is being provided at UAX's with local/outgoing registers and the existing UAX alarms are being incorporated onto the Alarm Sender. Refer Basis of Provision UAX Local Register and ANI equipment ER/TP 1303.

18.2 The audible alarm indications corresponding to various fault conditions are as follows :-

	Fault Condition	Alarm Indication	
	Release, Fuse, Meter routine test cord connected	NU Tone	- Prompt
	Charge Fail	O/F Busy Tone	- Alert No. 1
*	Control Set lockout	Ringing Tone	- Alert No.2
*	Control Set lockout & Charge Fail	Busy Tone	- Alert No.1 & No. 2
	NU Tone or Ringing failure	No Tone	- Prompt
	Junction out of order	No Tone	
	No Alarms	All Clear	- Inverted Ringing Tone

* UAX NZ 13 R- & RM-units do not have an Alert No. 2 alarm.

18.3 At a parent exchange where a technician is stationed, these test calls will be made by the technician. Where no technician is stationed, these test calls are to be made by operating staff. Where hours of attendance by technicians are limited, local arrangements are to ensure that all daily test calls are made by either technicians or operating staff.

18.4 The following indicates the standard allocation of test numbers for various size UAX's :-

For systems up to 200 lines (i.e., up to four A-units)	Call Test No. 811
For systems up to 400 lines (i.e., up to eight A-units)	Call Test Nos. 811 and 611
For systems up to 600 lines (i.e., over eight A-units)	Call Test Nos. 811, 611 and 411
For R-units, or RR- & RM-units	Dial the first digit of the 'R' unit number scheme followed by digit 9 and then trunk offer upon which the alarm indication will be heard.

18.5 The results of these routine alarm tests are to be recorded in permanent form in the Parent Exchange Diary.

18.6 Apart from such indicated faults, however, parent exchange operators should be encouraged to be on alert for erratic behaviour of dependant UAX's. Functional defects should not be tolerated or accepted by them as a normal condition. The operator should thus bring all defects (if only suspect) under the notice of the Maintenance Technician.

18.7 To this end, on the occasion of each routine visit to a UAX, the Maintenance Technician is required to telephone the supervisor at the parent exchange and inquire if any difficulties have been experienced.

18.8 Complaints indicating trunking inadequacy should be immediately reported to the District Engineer. At each visit the overflow meters should be read and recorded in permanent form. (See E.I. TELS Auto H 5021).

19. RELEASE CONDITIONS.

19.1 The release conditions provided on the UAX NZ 13 comply with those of the standard BPO UAX 13 - namely, calling party release with a delayed back release of one to four minutes for the called subscriber. The main reason for retaining the BPO release conditions is that because of the size of a UAX, it is not always practical to segregate toll and subscriber-dialled traffic. With this delayed back release, toll operators have some measure of control over the release of the connection - e.g., if the called subscriber accidentally restores the handset for a short period. This delay feature also enables a called subscriber to give a 'flash-back' signal to the manual board by flicking the switchhook without releasing the connection.

19.2 Some circuits, in particular the UAX NZ 13M and the UAX NZ 13R, include alternative connections whereby 'either-party' release may be adopted, if desired. However, it is not intended that these alternative connections should be used.

20. MISCELLANEOUS FACILITIES.

20.1 The following miscellaneous facilities, additional to those covered in the preceding paragraphs are provided by the UAX NZ 13 :-

(a) PBX line groups are possible on each pair of A-units equipped with Final selectors to GBW 13900/1. (One of the facilities of this final selector is PBX stepping.)

NOTE Final selectors to GBW 16660 do not have this facility and therefore cannot be used when PBX working is required. (See ER/TP 1054 para 3.4.)

(b) All subscribers connected to a UAX obtain access to the Group Centre TMX operator by dialling the single digit '0'. This applies whether the UAX is connected directly to the Group Centre or via a tandem UAX or AMX.

(c) On level '0' calls to the parent TMX, a discriminating signal is used to denote a calling CCB line. A separate green calling lamp or a superimposed ringing tone is used for this purpose depending on the type of junction signalling system in use.

(d) At metering exchanges CCB telephones (like 'M' subscribers and 'R' subscribers) are automatically barred dialling beyond the flat-rate area and receive NU tone if such connections are attempted. (See GBW 13910 Note 6, and para 21 of this report.)

(e) PG's are locked-out after a delay of 1 - 4 minutes and 'called subscribers held' are released automatically after a similar period. Outgoing junctions are released after 3 - 6 minutes if they are seized and no dialling takes place within that time.

(f) Revertive relay sets are also released after 3 - 6 minutes if the called subscriber does not answer.

(g) The Group Centre TMX operator has full control of connections originating from UAX subscribers with 'manual hold' and 'switchhook' supervision. Calls to UAX subscribers from the TMX operators have full 'switchhook' supervision, but the 'manual hold' facility is only available for the time it takes for the 'forced release' (1 - 4 minutes) action to become effective.

(h) The Group Centre TMX operator can 'trunk offer' any UAX subscriber already engaged in conversation.

21. ROUTE RESTRICTION AND DISCRIMINATING EQUIPMENT.

21.1 Some form of route restriction and discrimination will be required at all metering and non-metering UAX's. This section summarises this aspect of UAX design.

21.2 Restrictions and discriminations likely to be required are as follows :-

At Both Metering and Non-Metering UAX's

(a) Prevention of trombone calling from I/C junctions to O/G junctions on the same route. (Although this feature is desirable it may not be possible to provide it in all cases.)

(b) Barring access to an O/G junction route from local subscribers but allowing access from an I/C junction route.

(c) Barring access to an O/G junction route from a particular I/C junction route.

(d) Barring access to an O/G junction route from an I/C junction route but allowing access from local subscribers.

(e) CCB discrimination on a call to the parent TMX.

At Metering UAX's Only

(a) Barring of calls beyond the metering capabilities of the metering relay set.

(b) Access to '111' (and in some cases other special service numbers) for CCB and MP subscribers but barred access from dialling other numbers outside the flat-rate area.

21.3 Route restriction and discrimination can be provided by using the one or more the following methods :-

(a) Operation of NPA and NPB springs in GBW 13910 and appropriate strapping on group selector vertical marking banks.

(b) Route restriction and discriminating relay sets attached to O/G junction relay sets - i.e., GBW 13920 or GBW 13940.

(c) Facility built into O/G junction relay set - e.g., Uniselector in GBW 13950 or the NU relay in GBW 16831, GBW 20100, etc., strapped to operate or not to operate.

(d) At non-metering UAX's positive battery from I/C junction 'M' lead strapped on or off as required with the exception that positive battery cannot be removed from junctions requiring TO facility.

NOTE At metering UAX's positive battery is required to operate the NU relay in revertive call relay sets.

(e) Connection of I/C junctions to a subscriber's line circuit (only to be used for attached R-units - see ER/TP 1054 para. 4.7.19).

(f) By dividing I/C selectors at, for example, a G/S 1 parent exchange, into groups with access to O/G routes as required.

(g) Segregation of junction groups or class of subscribers into separate A-units. This method is only to be used if the desired restriction and discriminations cannot be obtained by the use of one or more of the other methods.

(h) Provision of an E-unit or E-shelves to give access to O/G junctions from one group of selectors, but restrict access from another.

(i) The discriminating selectors in an R-, RR- or RM-unit can be strapped for first digit dialled discrimination.

21.4 The route restrictions and discriminations required for a particular UAX installation and the method of provision are to be given in the Project Specification for the UAX concerned.

22. TRAFFIC CAPACITY

22.1 The link traffic on each A-unit - i.e., inclusive of subscribers originated plus incoming from junctions terminated on line finder levels - must not exceed 3.11E. Thus, although 10 I/C (or B/W) junctions can theoretically be connected to each A-unit, the link traffic is normally the limiting factor.

22.2 The Final selector traffic should not exceed the following figures:-

For A-unit Number		
A1	)	
A3	)	
A5	)	The final selector traffic should not
A7	)	exceed 1.36E for each unit.
A9	)	
A11	)	

For A-unit Numbers		
A1 & A2	)	
A3 & A4	)	
A5 & A6	)	The final selector traffic should not
A7 & A8	)	exceed 4.46E for each pair of units.
A9 & A10	)	
A11 & A12	)	

22.3 The originated traffic on each R-, RR- or RM-unit must not exceed 1.88E.

22.4 The terminal traffic on each R-, RR- or RM-unit - i.e., local plus incoming traffic - must not exceed 1.88E.

22.5 The traffic capacity of R-, RR- or RM-unit junctions depends on the type of junctions used (i.e., unidirectional or bothway) and whether the unit is an attached R-unit or a remote R- or M-unit. The grade of service for junctions to and from attached R-units is 0.01. For remote R- or M-units the grade of service is 0.02. The maximum number of circuits in both cases is six incoming and six outgoing - i.e., 6 B/W or 2 I/C, 2 O/G and 4 B/W junctions. Therefore the maximum traffic capacity is :-

		I/C	O/G
(a)	Attached R-unit	1.88E	1.88E
(b)	Remote R- or M-unit	2.28E	2.28E

22.6 The traffic capacity of link and final selector stages of UAX's should be ample to cater for most subscribers originated and terminated traffic at most installations. There is a possibility, however, that I/C junctions from remote R- and M-units or other exchanges may overload the L/F-G/S. circuits. This also applies to PBX lines, lines from M-units and, to a lesser extent, CCB lines. Therefore, I/C junctions and subscribers should be allocated selectively over all A-units to even out the originated and I/C traffic.

22.7 The following is an example of how junctions and subscribers lines can be distributed according to traffic carried at a non-metering UAX with 12 I/C subscriber dialling (SFD) junctions, 2 I/C and 4 B/W parent Toll junctions, 40 M-unit lines, 2 CCB subscribers and 8 A-units.

A-unit No.	SFD Junc No.		Parent Junc No.	M-unit Lines Unit M1			M-unit Lines Unit M2			CCB Lines
1	1	12		1	9	17		5	13	
2	2	11		2	10	18		6	14	
3	3	10		3	11	19		7	15	
4	4	9		4	12	20		8	16	
5	5		3 & 4 B/W	5	13		1	9	17	1
6	6		1 & 2 B/W	6	14		2	10	18	2
7	7		2 I/C	7	15		3	11	19	
8	8		1 I/C	8	16		4	12	20	

22.8 It may not always be possible to prevent overloading by distributing junctions and subscribers as explained in para. 22.6 and 22.7. The following are three cases where difficulty can be experienced :-

(a) When the sum of the subscriber originated and I/C junction traffic will be greater than the capacity of the A-unit L/F-G/S. (links)

(i) To overcome this E-unit shelves (see para 9.2) should be installed to carry a portion of the I/C junction traffic.

(ii) If possible, allocation of incoming junctions to E-unit shelves should be on the basis of whole shelves, with late choice junctions retained on line finder levels as necessary.

(iii) When a portion only of the I/C junctions are terminated on line finder levels, Tables 1 and 2 below should assist in determining the link traffic.

(b) When an exceptionally high proportion of subscribers is connected to an M-unit or M-units. (see para 14.4.) If it is apparent that redistribution of I/C junctions amongst A-units not serving M-unit subscribers, or terminating the I/C junctions directly onto group selectors will not reduce the link traffic to a satisfactory level the only other alternative is to install an additional A-unit. The approval of the Engineer-in-Chief is required before an additional A-unit can be installed for this purpose.

(c) When overloading of the final selectors in an odd A-unit occurs because the terminated rate per subscriber is above 0.027E. It will be necessary to restrict the allocation of subscribers in this A-unit to keep the terminated traffic within the final selector capacity of 1.36E. This will mean that the associated A-unit will be required at an earlier date.

TABLE 1 - TABLE FOR DETERMINING THE PROPORTION OF INCOMING TRAFFIC CARRIED BY EACH JUNCTION WHEN TRAFFIC CAPACITY TABLE L (1 IN 50) APPLIES
(SEE E.I. TELS Traffic B 3100)

Percentage of total traffic carried by the X-th choice junction when the following is the total number of junctions or I/C junctions in the group.

Total Juncs	2 B/W	3 B/W	4 B/W	5 B/W	6 P/D	7 P/D	8 P/D	9 P/D										
Total I/C or I/C of B/W Juncs					5 I/C or I/C of B/W	5 I/C or I/C of B/W	5 I/C or I/C of B/W	5 I/C or I/C of B/W	6 I/C or I/C of B/W	7 I/C or I/C of B/W	8 I/C or I/C of B/W	9 I/C or I/C of B/W	10 I/C or I/C of B/W	11 I/C or I/C of B/W	12 I/C or I/C of B/W	13 I/C or I/C of B/W	14 I/C or I/C of B/W	15 I/C or I/C of B/W
1st choice	83	63	49	39	50	46	42	40	30	26	22	19	17	15.2	13.4	12.1	11.1	10.2
2nd choice	17	29	31	28	22	30	29	29	24	23	20	18	16	14.0	13.0	11.8	10.8	10.0
3rd choice		8	15	19	16	13	19	18	21	18	18	16	15	13.6	12.4	11.3	10.5	9.7
4th choice			5	10	9	7	7	9	13	15	14	14	14	12.7	11.7	10.8	10.1	9.4
5th choice				4	3	4	3	4	8	9	13	12	11	11.3	10.7	10.2	9.6	9.1
6th choice									4	6	6	9	10	9.5	9.7	9.4	9.1	8.6
7th choice										3	5	6	7	7.9	8.4	8.4	8.4	8.1
8th choice											2	4	5	6.4	6.9	7.3	7.4	7.4
9th choice												2	3	4.5	5.4	6.1	6.4	6.6
10th choice													2	3.1	4.0	4.8	5.3	5.7
11th choice														1.8	2.8	3.6	4.3	4.8
12th choice															1.7	2.5	3.2	3.9
13th choice																1.7	2.3	3.0
14th choice																	1.5	2.1
15th choice																		1.4

TABLE 2 - TABLE FOR DETERMINING THE PROPORTION OF INCOMING TRAFFIC CARRIED BY EACH JUNCTION WHEN TRAFFIC CAPACITY TABLE L (1 IN 30) APPLIES
(SEE E.I. TELS Traffic B 3100)

Percentage of total traffic carried by the X-th choice junction when the following is the total number of junctions or I/C junctions in the group.

Total Juncs	2 B/W	3 B/W	4 B/W	5 B/W	6 P/D	7 P/D	8 P/D	9 P/D										
Total I/C or I/C of B/W Juncs					5 I/C or I/C of B/W	5 I/C or I/C of B/W	5 I/C or I/C of B/W	5 I/C or I/C of B/W	6 I/C or I/C of B/W	7 I/C or I/C of B/W	8 I/C or I/C of B/W	9 I/C or I/C of B/W	10 I/C or I/C of B/W	11 I/C or I/C of B/W	12 I/C or I/C of B/W	13 I/C or I/C of B/W	14 I/C or I/C of B/W	15 I/C or I/C of B/W
1st choice	80	59	45	35	46	43	41	37	28	24	20	18	16	13.9	12.5	11.3	10.4	9.5
2nd choice	20	30	31	27	23	30	28	28	25	22	19	16	15	13.4	12.1	11.1	10.2	9.4
3rd choice		11	17	20	16	14	19	20	19	19	17	15	14	12.8	11.7	10.7	9.9	9.2
4th choice			7	12	16	8	8	11	14	14	14	14	13	12.0	11.2	10.3	9.6	8.9
5th choice				6	5	5	4	4	9	10	11	12	11	11.0	10.4	9.8	9.2	8.7
6th choice									5	7	9	10	10	9.7	9.3	9.2	8.8	8.3
7th choice										4	6	7	8	8.5	8.5	8.4	8.3	7.8
8th choice											4	5	6	6.9	7.4	7.5	7.5	7.4
9th choice												3	4	5.3	6.1	6.5	6.7	6.7
10th choice													3	3.9	4.7	5.4	5.8	6.1
11th choice														2.6	3.5	4.3	4.9	5.3
12th choice															2.4	3.3	3.9	4.4
13th choice																2.2	3.1	3.6
14th choice																	2.1	2.7
15th choice																		2.0

23. TRAFFIC RATES.

23.1 UAX traffic rates vary considerably depending on whether message-rate or flat-rate working applies, the proportion of multi-party subscribers, and the geographical location of the exchange. It is therefore not possible to predict with any accuracy what the traffic rates are likely to be for a particular UAX. However, once the exchange is established, traffic checks can be taken as outlined in para 24, and the figures obtained will indicate if any corrective action is necessary. If it is not possible to estimate the traffic rate for a particular UAX the following rates may be used as a general guide :-

(a)	<u>For I, X, C, S or P subscribers</u>	<u>UAX's Message-Rate on Parent</u>	<u>UAX's Free-Rate on Parent</u>
	Originated Rate	0.02E/sub	0.03E/sub
	Terminated Rate	0.02E/sub	0.03E/sub
	I/C Junction Rate	1.0E/100 subs	2.0E/100 subs
	O/G junction Rate	1.0E/100 subs	2.0E/100 subs
(b)	<u>For M and R subscribers</u>		
	Originated Rate	0.016E/sub	0.024E/sub
	Terminated Rate	0.016E/sub	0.024E/sub
(c)	<u>For Attached R-unit</u>		
	I/C Junction Rate	1.3E/100 subs	1.8E/100 subs
	O/G Junction Rate	1.3E/100 subs	1.8E/100 subs
(d)	<u>For Remote R- or RM-unit</u>		
	I/C Junction Rate	1.0E/100 subs	1.5E/100 subs
	O/G Junction Rate	1.0E/100 subs	1.5E/100 subs

24. TRAFFIC RECORDING.

24.1 Although automatic traffic recording facilities for measuring UAX junction traffic are usually available at the parent exchange, the only means of recording internal UAX traffic is by the manual count methods. (See E.I. TELS traffic C 5102)

24.2 In order to verify the original design criteria, both internal and junction traffic checks are to be taken following the initial UAX cut-over, when the traffic has settled down to a normal level.

24.3 Junction traffic checks are then to be taken annually as indicated in E.I. TELS Traffic C 5101, and internal traffic checks only for specific investigations as directed by the local Engineer or Senior Technician-in-Charge.

24.4 Because sufficient equipment is provided for both new installations and extensions to provide for the anticipated demand three years post cut-over, it is unlikely that traffic congestion will be experienced immediately following cut-over.

24.5 The presence of either internal or junction traffic congestion can usually first be detected by a comparison of monthly overflow meter reading with the table of critical monthly overflow meter readings given in E.I. TELS Traffic C 5001.

24.6 When the overflow meter reading reaches the critical figure for a particular route, action should be taken as follows :-

(a) A traffic check should be taken if congestion is experienced on a junction route to an exchange equipped with automatic traffic recording equipment. However, should internal congestion be experienced, or junction congestion on a route to an exchange not equipped with an automatic traffic recorder, the question of whether or not a manual count traffic check should be taken is left to the discretion of the local Engineer or Senior Technician-in-Charge. (see E.I. TELS Traffic C 5101)

(b) If congestion is recorded internally, consideration should first be given to a possible re-distribution of I/C junctions or M-line subscribers line circuits. If this does not overcome the congestion or it is apparent that it will not, a requisition should be submitted for additional selectors. Should all selector positions be already fully equipped alternative solutions such as re-distribution of busy subscribers line circuits, installation of E-unit shelves etc., should be considered. (see para 22.8)

(c) If congestion is external, unless junction relief is already programmed, re-assessment of forecast subscriber and junction traffic should be immediately evaluated to ensure adequate relief is provided as soon as possible.

24.7 Generally speaking internal trunking increases can be arranged without undue delay, and curtailment of subscriber allocations should rarely be necessary. A temporary restriction may be applied until relief measures can be taken. In such cases the restriction of net capacity is to be recorded on all relevant Engr 18C returns.

25. DEFINITIONS OF

(A) Full Facility Signalling
(B) Limited Facility Signalling
(C) Auto-to-Auto Junctions
(D) Auto-to-Manual Junctions

25.1 Definitions of signalling terms applied to junctions carrying toll traffic.

(a) Full Facility Signalling - Any signalling system used over a basic junction which provides for (but may not necessarily use) all of the following facilities :-

(i) Subscriber dialling;

(ii) Lamp discrimination on CCB calls;

(iii) Incoming dialling access from the national trunk network;

(iv) Switchhook supervision and trunk offer from the Group Centre TMX;

(v) Manual hold where desired.

(b) Limited Facility Signalling - Any signalling arrangement which does not provide for one or more of the above described facilities.

25.2 Definition of terms used to describe junctions not carrying toll traffic.

(a) Auto-to-Auto junction - provides for subscriber dialled calls between two automatic exchanges.

(b) Auto-to-Manual junction - provides for auto exchange subscriber access to a manual exchange operator where assistance in setting up a non chargeable call to another subscriber is required.

26. APPLICATION OF LIMITED AND FULL FACILITY JUNCTION SIGNALLING.

26.1 Limited facility signalling - UAX junctions to a UMX or BMSB parent exchange.

26.1.1 Limited facility signalling relay sets are normally limited to applications involving junctions between UAX's and parent UMX/BMSB's where operating conditions dictate the provision of relay sets equipped for a form of signalling other than full facility - e.g., simplex, rural carrier etc. In many cases the junctions may be up to loop disconnect signalling and insulation resistance standards, but the provision of full facility signalling must await the conversion of the parent exchange to automatic working.

26.2 Full Facility and Limited facility signalling - UAX junctions to an Automatic parent exchange.

(a) Full facility signalling will normally be provided for all new UAX's.

(b) Limited facility signalling incorporating distant operator access via the junction tandem exchange as a long term provision can be used for new UAX's only if all of the following conditions apply :-

(i) Wider area free dialling is unlikely to be required in the near future.

(ii) Substantial economic savings will be achieved by the use of limited facility signalling.

(iii) There is clear evidence that '111' service will not be required in the foreseeable future.

NOTE Limited facility signalling adapters incorporating selector level access are available only for use with out-of-band and rural carrier junction circuits, to the extent laid down in the ER/TP 1403 Basis of Design trunking key sheets sections 7.3 and 7.4 respectively.

(c) Limited facility signalling (not necessarily incorporating distant operator dialling) as a short term provision for new UAX's not covered by (b) above can be used if expedient, provided that firm proposals are in hand to upgrade to full facility signalling within the near future.

(d) At extensions to UAX's with limited facility signalling, every effort should be made to upgrade to full facility working unless the conditions laid down in (b) apply in full.

27. JUNCTION SIGNALLING AND TRANSMISSION LIMITS.

27.1 The following are the DC junction signalling limits applicable to both simplex and loop signalling. (See E.D. Report No. 1086) :-

(a) Simplex Signalling

(i) A maximum DC loop resistance of 3000 ohms;

(ii) Insulation resistance must not be less than 20,000 ohms from either wire to any other wire or earth.

NOTE Simplex signalling will not permit full facility working (see para 25.1).

(b) Loop Signalling

(i) A nominal maximum for a single junction of 1800 ohms loop CR (2000 ohms loop CR permissible in some instances);

(ii) Insulation resistance must not be less than 50,000 ohms from either wire to any other wire or earth.

27.2 Signalling limitations on the application of loop signalling techniques are as follows :-

(a) A UAX system must not be more than two junction links from the parent Group Centre TMX (In the majority of cases a single link only will be used.)

(b) Direct dialling between any two subscribers in a Toll group must be limited to a maximum of five junction links in tandem and the overall resistance of all links in any connection must not exceed 6000 ohms.

27.3 UAX junction transmission limits are covered in E.I. TRANS Telephones B 2000. The basic rules are as follows :-

(a) Maximum line loss for basic junctions is 4.5 dB, the minimum line loss is 2 dB, and the median line loss for a group should not exceed 3.5 dB.

NOTE If two links are involved to the group centre, the line limit of 4.5 dB applies to the sum of the two sections.

If AC3 signalling is used, allowance must be made for a loss of 0.75 dB at each terminal - i.e., that actual maximum physical junction loss limit the becomes 3 dB.

(b) Maximum auxiliary junction line loss (i.e., local exchange to local exchange junctions) is 13dB.

(c) Maximum number of tandem auxiliary junctions is four.

27.4 It will be noted from the above that the number of allowable tandem auxiliary junction links from a signalling point of view exceeds by one the maximum allowable from transmission considerations (i.e., five and four respectively). However, there are instances where both limitations can be fulfilled - e.g., a UAX with negistor switching DC repeaters located at an intermediate exchange. This would involve two links in tandem to the Group Centre with regard to signalling, but only one link from a transmission aspect. Another instance is the use of remote R- or M-units.

27.5 There are various ways of providing junctions and the method used is largely dependant on the economics of the particular situation provided that the standard signalling and transmission limits are met.

27.6 For most installations loaded cable will be used for junctions. There will, however, be occasions when cable will either be uneconomical or cannot alone meet the transmission or signalling standards. In such cases, alternative methods must be adopted and the following outline some of the schemes available :-

(a) Where the transmission is below standard but signalling limits may be met, a negistor may be equipped.

(b) Where the difficulty is mainly due to DC signalling limitations, AC3 signalling equipment may be used. AC3 relay sets are relatively expensive and where an intermediate exchange or P.O. building is available, the use of DC repeaters is preferred. The use of such repeaters is restricted to unidirectional subscriber dialled junctions, so that AC3 signalling may still be required on the toll junctions.

(c) Where the use of cable to meet transmission and signalling limits is uneconomical, carrier systems may be applicable. The following arrangements are possible :-

(i) Open-wire carrier systems, using the in-built rural or out-of-band signalling of essentially limited facility type.

(ii) Open-wire carrier systems with AC3 signalling for full facility working.

(iii) Carrier-on-Cable systems with various type of signalling (including AC3 if full facility working is desired).

28. DIVISION OF JUNCTIONS.

28.1 The question of whether bothway working, partial division, full division, combined level 0 & 1, or separate level 0 & 1 junction should be adopted, is generally dictated by the economics of relay set provision and the desirability to retain full availability conditions. (see E.I. TELES Traffic B 3100)

28.2 The following rules normally apply :-

(a) Up to five junction - bothway working, combined level 0 & 1

(b) Six to fifteen junctions - partial division, combined level 0 & 1

(c) Over fifteen junctions - separate level 0 & 1 junctions with bothway or partial division on each route in accordance with (a) and (b) above, or full division in accordance with the traffic should the number of junctions exceed fifteen on any route.

NOTE Where only bothway relay sets are available - e.g., rural carrier terminations, or where junctions are connected to manual boards, bothway working can be retained up to ten circuits.

For auxiliary junctions, bothway and partial division is provided in accordance with (a) and (b) above for up to fifteen junctions. Auxiliary junctions in excess of fifteen are full divided in accordance with traffic.

28.3 The above rules apply particularly where junctions are provided in cable, however, where open aerial, carrier or AC3 signalling is required, rigid adoption of these rules may be undesirable. In addition, the use of DC repeaters would necessitate fully divided junctions (see para 25.6 (b)) and the use of negistors may favour earlier introduction of separate level 0 & 1 junctions.

29. PERFORMANCE TESTS.

29.1 All selectors and junction relay sets, etc., must be subjected to functional tests prior to cut-over in order to verify their satisfactory performance. (See E.I. TELES Auto H 3051)

29.2 As part of these pre cut-over tests, the conductor resistance, insulation resistance, and transmission loss of the various physical junctions should be measured in order to verify that they are within the standard limits. (See clause 27 and E.I. TRANS Teles B 2000)

NOTE The insulation resistance measurements should obviously be made under adverse weather and humidity conditions but need not, of course, be repeated if tests were carried out prior to commencement of the equipment installation.

29.3 The transmission loss measurements of junctions are obtained by using a Siemens Halske sweep set.

30. SERVICE STANDARDS.

30.1 The standards of local and junction signalling are laid down in this Report. (See para 2.7 & 27.0)

30.2 The standards for grade of service are P = 0.01 for internal traffic routes, P = 0.02 for external ‘basic’ traffic routes, and P= 0.03 for external ‘auxiliary’ traffic routes. (ref E.I. TELS General A 0011 and TELES Traffic B 3100)

30.3 Standard tests and inspections applicable to UAX’s are covered in E.I. TELS Auto H 5021, and service and maintenance standards in E.I. TELES Gen O 3001 and related E.I.’s.

31. BASIS OF PROVISION.

31.1 The basis of provision of all equipment used to construct a UAX system are given in ER/TP 1054 - Basis of Provision : N.Z. Unit Automatic Exchange Equipment.

32. ENCLOSURES.

32.1 Appendix No. 1 - UAX Unit Dimensions and Equipment Capacity.
Appendix No. 2 - Discriminating Signals for Combined Level 0 & 1 working.

33. REFERENCES.

33.1 The following documents should be referred to in conjunction with this Engineering Report :-

ER/TP 1054 Basis of Provision : N.Z. Unit Automatic Exchange Systems

IS 1130 General Aspects of Installation : UAX NZ 13

Drg 24593 Number Allocation Chart UAX NZ 13

END

ER/TP 1048 : APPENDIX No. 1

UAX : UNIT DIMENSIONS AND EQUIPMENT CAPACITY

Units	Type of Equipment	Height	Depth	Width	Weight
A	Ind and Party	8' 3"	1' 2½"	2' 6⅞"	565 lbs
B	Junc and Multi-party	8' 3"	1' 2½"	2' 6⅞"	322 lbs
C	MDF and Misc	8' 3"	1' 9"	2' 7⅞"	662 lbs
E	Group Selectors	8' 3"	1' 2½"	2' 6⅞"	336 lbs
M	Multi-party (CB)	8' 3"	1' 2½"	2' 6⅞"	451 lbs
RM	Multi-party (CB)	8' 3"	1' 8"	3' 0"	
R	Rural-party (LB)	8' 3"	1' 8"	3' 0"	
S	AC signalling R/S	8' 3"	1' 2½"	2' 6⅞"	392 lbs

NOTE : Weights are for cabinets excluding selectors, jacked-in equipment and junction relay set plates.

Unit	Equipment Capacity	Capacity
	Line Circuits, 3 relay	50 (60)
	L/F Allotters	2
	Control Relay Sets	2
	Line Finders	8
	Subscribers' Meters	50
A	L/F Overflow meters (No. 101A)	1
	G/S Overflow meters (No. 100C)	10
	Group Selectors	8
	Final Selectors	5
	Maximum permissible CCB lines	10
	Maximum permissible I/C or B/W junctions	10
B	Junc., Rev., M & R Relay Sets	Dependant on equipment installed
	MDF Fuse Mountings, 20 pair	16
	MDF Protectors (Subs & Junc's)	12
	Relay Set - Ringing & Meter Pulses	1
C	Relay Set - Tones & Time Pulse	1
	Osc Panel (three 400 c.p.s. and one 900 c.p.s. osc's)	1
	Transformer Panel (Ringing & Tones)	1
	Line Tester Panel	1

ER/TP 1048 : APPENDIX No. 2

UAX :BARRING AND DISCRIMINATION SIGNALS

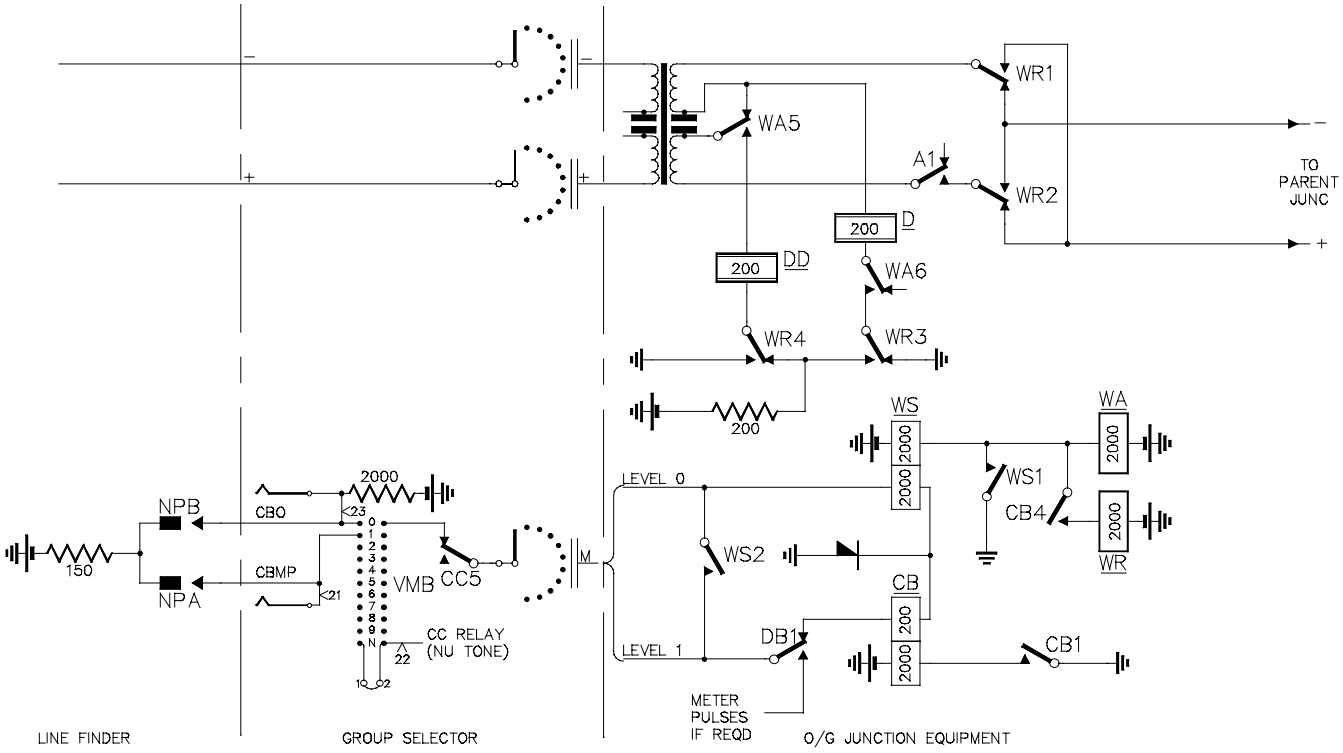


Fig 1

Fig 1 shows the circuit elements at a UAX which provide the appropriate signalling conditions on combined junctions to the parent exchange.

NPA Springs

NPA springs operating on any line finder level will bar access from any subscribers or junctions connected to that line finder level to routes strapped via U-point 21 for NU Tone on the group selector VMB.

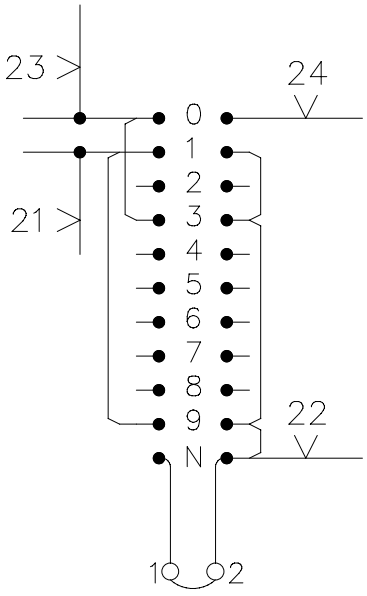
NPB Springs

NPB springs operating on any line finder level provide CCB discrimination for subscribers or junctions connected to that line finder level when a level 0 call is dialled.

Group Selector VMB Strapping

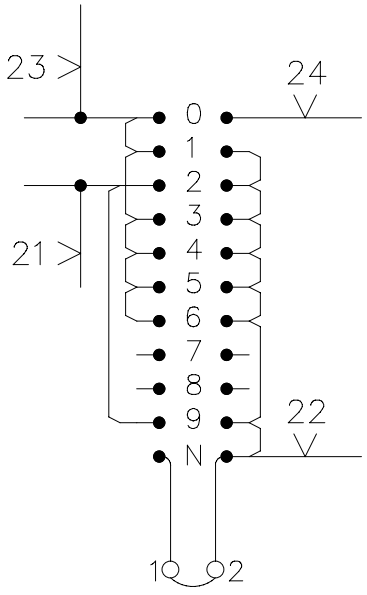
Group selector VMB strapping between U-point 23 (from NPB springs) to any G/S level will provide NU tone as desired regardless of NPA/NPB spring operation for subscribers or junctions connected to any line finder level.

The following examples - namely, TARIKI and TIRAU UAX's are given below :-



G/S VMB

The strapping shown is for a combined Level 0 and 1 to the parent exchange and an adjacent exchange route from level 2.
Levels 4 to 8 are for local subscriber numbers.
Level 9 is for revertive.
Level 3 is barred and returns NU tone to caller.
Levels 1 and 9 are barred from line finder levels equipped with NPA cams.



G/S VMB

The strapping shown is for level 0 only to the parent exchange and an adjacent exchange route from level 2.
Levels 7 and 8 are for local subscriber numbers.
Level 9 is for revertive.
Levels 1, 3, 4, 5 and 6 are barred and return NU tone to caller.
Levels 2 and 9 are barred from line finder levels equipped with NPA cams.

At non-metering UAX's the NPA springs are usually arranged to operate on levels 8 and 9 and the NPB springs to operate on levels 1, 2, 8 and 9. At metering exchanges line finder levels 2 and 3 may be used as shown in the table overleaf and the operation of the NPA and NPB spring should be arranged accordingly.

CONNECTION OF LINES		OPERATION IF NPA AND NPB SPRINGS	
Level 2	Level 3	NPA Springs	NPB Springs
CCB	ISX	Levels 2, 8 and 9	Levels 1, 2, 8 and 9
CCB	MR	Levels 2, 3, 8 and 9	Levels 1, 2, 8 and 9
MR	ISX	Levels 2, 8 and 9	Levels 1, 8 and 9

It should be noted that when a remote M-unit is connected to a UAX the NPB cams should not be equipped on levels 8 and 9 as the operation of the NPB springs would result in level 0 calls from the remote M-unit being forwarded to the parent exchange with a CCB discrimination.

The Basic Discrimination Signals are :-

1 A negative 2000 ohm battery is passed from the group selector over the M-wire to the outgoing junction equipment when a level 0 call is required by an ordinary subscriber.

2. The 2000 ohm battery is shunted by a negative 150 ohm resistor in the line finder if the level 0 call originates from a CCB subscriber.

3. There is no signal over the M-wire to the outgoing junction equipment on level 1 call from ordinary subscribers.

4. A negative 150 ohm battery is transmitted over the M-wire on level 1 call from CCB subscribers.

5. By the use of junction relay sets equipped with a route barring relay set - e.g., GBW 20100, GBW 16831, etc., - a positive battery on the M-wire derived from GBW 16880 can be used to prevent trombone call on incoming junctions.

The method of signalling over the UAX junctions is as follows :-

1. A level 1 call (i.e., a call to the automatic equipment at the parent exchange) utilises a loop calling signal which is followed by loop-disconnect pulses.

2. A level 0 call from an ordinary subscriber provides a calling signal which of negative battery on the + wire.

3. A level 0 call from a CCB subscriber provides a calling signal which consists of earth on the - wire.

NOTE : The discrimination method shown above does not apply at the ‘new’ UAX trunking using sets, GBW 16910 or equivalent, refer to ER/TP 1054 para 4.2.

END