

subject: PBX System - 802A Electronic PBX



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to: Chief Engineers

from: Engineering Director - Customer Telephone Systems

synopsis: Development schedules have been established and design effort has been initiated to produce an 802A PBX which is a light traffic Electronic Dial PBX, primarily intended for Hotel/Motel service in the 0 to 400 line range. Availability is expected in November, 1971.

* * *

A joint development team of Bell Laboratories and Western Electric Co. personnel has begun development of the 802A PBX on an expedited schedule at the Customer Telephone System Switching Center at Denver, Colorado. During the initial planning stage the 802A had been unofficially designated the 801H PBX. The 802A, an Electronic, non-redundant common control PBX with a three stage ferreed switching network capable of a 2.0 CCS per line traffic rate at maximum line capacity per cabinet is primarily intended to provide communication service for the Hotel/Motel customer. The basic PBX provides limited series 100 service plus generally required Hotel/Motel features, and includes the ability to add optional Hotel/Motel type features on an economically optimum basis. The 802A physical design allows 124, 252, and 380 line discrete systems to be installed through use of three 800A PBX type cabinets of 124, 128 and 128 lines respectively when fully equipped.

The attachments to this letter give a more detailed description of the PBX including a list of features, basic physical design arrangements, station numbering plan, and preliminary Bell Laboratories generated cost curves.

The cost curves indicate that the efficient use of 800A PBX technology in the circuit design of the 802A produces a light traffic PBX for Hotel/Motel service that has definite economic advantage in systems of 160 lines or more, as well as systems of 100 to 160 lines that are likely to grow.

A trial model of the 802A is scheduled for availability in August, 1971 with production models to be available by November, 1971.

Questions concerning the 802A PBX may be directed to Mr. John Kelly, Assistant Engineering Manager, (212 393-3180).

A handwritten signature in cursive script, appearing to read "W. Schiavone". The signature is written in black ink and is positioned above the typed name.

Engineering Director

JRK:AF

Attachments

Design Characteristics

The 802A uses 800A (and 801A) circuit and physical design technology with modifications applied where necessary to provide required features. Modifications are also implemented where efficiency and economy of design can be achieved. Hybrid Integrated Circuit technology is employed to produce the printed circuit board types, many of which are used in the 800A or 801A PBX's. The solid state, non-redundant common control uses the wired logic concept identical to 800A design.

The four wire primary, secondary and tertiary switching network uses ferreed metallic contact switches which include one wire for message registration. Any Primary switch (station) network port has access to any tertiary switch (trunk) network port with network completion accomplished via the line and trunk marketing concept under control of the Network Control Circuit. A station-to-station call uses an Intercom Trunk Circuit which requires two network trunk ports and requires two network links.

Each 802A unit (cabinet) contains a complete switching network segment that can provide modular expansion by trunk port interconnection to provide systems of 124, 252 and 380 lines as shown on Figure 1. The station line arrangement and expansion characteristics are also shown on Figure 1.

The basic system is contained in one, two, or three 800A type cabinets of 124, 128, and 128 lines respectively, requiring 7 square feet of equipment space each. For equipment and maintenance, 39 square feet, 53 square feet and 68 square feet of floor space is required for one, two, and three cabinet systems, respectively. Addition of some of the optional features may require an additional cabinet.

Service Characteristics

Table 1 lists the features provided in the 802A PBX. The types of station restriction available are defined on Figure 1. Direct dialing of local calls is provided by single digit access to a local control office trunk, followed by seven digit dialing after second dial tone is received. The one-way outgoing and two-way CO trunks will have the necessary circuitry for Attendant Recall and Call Completion of incoming calls by the attendant. The attendant will not be able to complete station-to-station calls. Direct dial to the Toll Operator is provided by single digit access. Toll Rering to the attendant is provided to permit time and charge reporting of toll calls. Toll calls attempted on the local central office trunks by room stations will be diverted to busy tone when a battery reversal is received from the central office. If the central office is not equipped to return a battery reversal, then call

Controllers must be provided either at the PBX or at the local central office according to the involved Associated Company choice.

Hunting

Station Hunting will be provided on Administrative Stations only. Independent hunting groups are possible and can provide one way hunting only.

Room-Station Number Correlation

It will be possible to assign the room number as the room station dialing code. Three-digit, or three-digit and four-digit dialing will be provided. To economically provide this feature, the limitation has been imposed that the assignments be made in modules of ten. Table 2 outlines the limitations of the numbering plan. Any number of room telephone assignments per floor other than a multiple of 10 may result in unused line terminations. However, these terminations may be used elsewhere, but the dialing code will be fixed.

Single Digit Dialing

The single digits "8," "9" and "0" will be used for access to toll trunks, to local central office trunks, and to the attendant, respectively. Seven single-digit codes are available for assignment to special service stations. If more than seven special service stations are required, the excess stations over seven must be assigned three-digit or four-digit codes.

Power Failure Transfer

In the event of a power failure, the administrative lines will be automatically connected to the outgoing local central office trunks.

Attendant Console

A single attendant console of the new universal type, operationally similar to the 800A PBX console, will be provided. In addition to the standard Attendant Trunk Pickup Keys, keys are provided for Toll Trunk termination for Attendant Rering, for Station-to-Station Dialing Restriction, for the Attendant Paging Trunk, and for Intercom Trunk termination. A descriptive view of the proposed 802A console layout is shown on Figure 2.

Night Service

The Night Service option will be provided by a fully parallel attendant console. The Night Console will be identical to the main console and will be activated by operation of the NITE Key at the main console.

Additional Attendant Console

An additional main console can be provided on an optional basis to allow parallel attendant operation if desired.

Message Registers

Resettable Message Registers with the capability of adding 1 to 5 surcharge units will be associated with each station line on an optional basis. The register will score on outgoing local connections by means of a third wire from the central office. The message registers must be mounted external to the 802A PBX.

Message Waiting

The Message Waiting feature will be optionally provided using the standard two-wire Message Waiting Station Set (500 YR) with control circuitry included in the 802A station line circuit. A Message Waiting Console, separate from the Attendant Console, must be provided.

Room Status and Wake Up Service Access

Access to Room Status and Wakeup Service Systems will be provided, but Bell System Room Status and Wakeup Service Systems are not available and will not be included with the initial 802A PBX development.

Station-to-Station Dialing Restriction

A Station-to-Station Dialing Restriction feature can be optionally provided to allow the attendant to eliminate all Room to Room dialing capability by operating one control key. In the restricted mode, room to room dialing attempts will alert the attendant by flashing the key lamp associated with the involved Intercom Trunk. The attendant may answer the call by operating the Intercom Trunk Key associated with the flashing lamp. The attendant may then deny the call, or permit the Intercom trunk to complete it by operating the CALL COMP Key.

Busy Lamp Field

A Busy Lamp Field can be provided with locally engineered arrangements by extending the proper wires from terminals on the equipment carriers to a locally provided Busy Lamp Console. The Busy Lamp Field access terminal designations will be specified in 802A documentation to facilitate the required interconnection.

Costs

Figure 3 shows the estimated cost curves prepared by the Development Dept. at Bell Laboratories. Western Electric Preliminary cost estimates are scheduled to be available in November, 1970. The curves of Figure 3 show uninstalled cost. A Marketing Dept. requirement based on cost specified that the basic 802A PBX should have a maximum installed cost of \$125 per line over the entire line size range of marketability.

Superior operating and feature characteristics, together with more flexible rate plans proposed for Hotel/Motel installations, should make the 802A PBX very marketable for installations in the 160 to 380 line range, and definitely marketable for installations in the 100 to 160 line range that are expected to require expansion in the relatively near future.

FIGURE 1

802A STATION LINES AND TRUNKS
TYPES/CARRIER

ROOM PHONES

1. Three or Four Digit Codes
2. Class of Service = Toll Restriction on Local CO Trunks
3. Message Registers
4. Message Waiting

HOUSE PHONES

1. Three or Four Digit Codes
2. Class of Service = Trunk Access Restricted

RESERVATION PHONES

1. Three or Four Digit
2. Class of Service = Station and Trunk Access Restricted

ADMINISTRATIVE PHONES

A. Single Digit

1. Single Digit
2. Class of Service = Unrestricted
3. Hunting
4. Make Busy

B. Other

1. Three or Four Digit
2. Class of Service = Unrestricted
3. Hunting
4. Message Waiting

FX - Flexible
Cross-Connection
as RP, House
Phone, or
Reservation
Phone
RP - Room Phone

SD=Single Digit AD=Administrative-Other

7 - SD		
3 - AD	4 - AD	4 - AD
10 - FX	10 - FX	10 - FX
40 - RP	50 - RP	50 - RP
Carrier 1	Carrier 3	Carrier 5
4 - FX	4 - FX	4 - FX
60 - RP	60 - RP	60 - RP
Carrier 2	Carrier 4	Carrier 6

TRUNKING ARRANGEMENT

Cabinet 1

- 6 Intercom
- 4 Toll-one way out
- 4 Local CO-one way out
- 4 Local CO-two way

Cabinet 2

- 2 Intercom
- 4 Toll-one way out
- 4 Local CO-one way out
- 3 Local CO-two way

Cabinet 3

- 0 Intercom
- 4 Toll-one way out
- 2 Local CO-one way out
- 1 Local CO-two way

CABINET 1	CABINET 2	CABINET 3
124 lines	128 lines	128 lines
18 trunks	13 trunks	6 trunks
32 links	32 links	32 links
2 registers	1 register	1 register
3 ATT trunks		1 ATT trunks
252 lines		
31 trunks		
64 links		
3 registers		
3 ATT trunks		
380 lines		
37 trunks		
96 links		
4 registers		
4 ATT trunks		

TABLE 1

802A SYSTEM FEATURES

	<u>BASIC</u>	<u>OPTIONAL</u>
Station-to-Station Dialing	X	
Restricted Stations (See Figure 1)	X	
Direct Outward Dialing - Local Calls	X	
Direct Dial to Toll Operator	X	
Toll Diversion	X	
Station Hunting	X	
Room-Station Number Coorelation	X	
Single-Digit Dialing	X	
Attendant Console	X	
Call Transfer-Attendant	X	
Power Failure Transfer	X	
Station Message Registers		X
Message Waiting		X
Access to Room Status System		X
Access to Wake-Up Service System		X
Busy Lamp Field		*
TOUCH-TONE Calling		X
Night Service - Parallel Console		X
Station-to-Station Dialing Restriction		X
Attendant Paging		X
Tie Trunks		X
Reserve Power		X
Additional Attendant Console		X

* Can be provided on Locally Engineered Basis by extending proper leads from terminals on Equipment carriers to a locally provided Busy Lamp Console.

TABLE 2

LIMITATION OF THE NUMBERING PLAN - 802A

<u>ROOMS/FLOOR</u>	<u>A</u>	<u>B</u>	<u>C</u>	<u>D</u>	<u>E</u>	<u>F</u>
10	40	100	150	210	260	320
15	30	75	105	150	195	240
20	40	100	140	200	260	320
25	25	75	150	175	200	250
30	30	90	150	210	240	300
40	40	80	120	200	240	320
50		100	150	200	250	300
60		60	120	180	240	300

A = Number of room phones possible with one carrier.

B = Number of room phones possible with two carriers.

C = Number of room phones possible with three carriers.

D = Number of room phones possible with four carriers.

E = Number of room phones possible with five carriers.

F = Number of room phones possible with six carriers.

The above table assumes that the flexible cross-connectable lines are not assigned as room phones. It is possible to increase the number of room phones above by as many as 30 by assigning the flexible cross-connectable lines as room phones.

ICT = Intercom Trunk
 SAW = Semi-Automatic Wakeup
 2W/1W = 2 way or 1 way CO Trunks
 Dial Rest. = Station-to-Station Dial Restriction

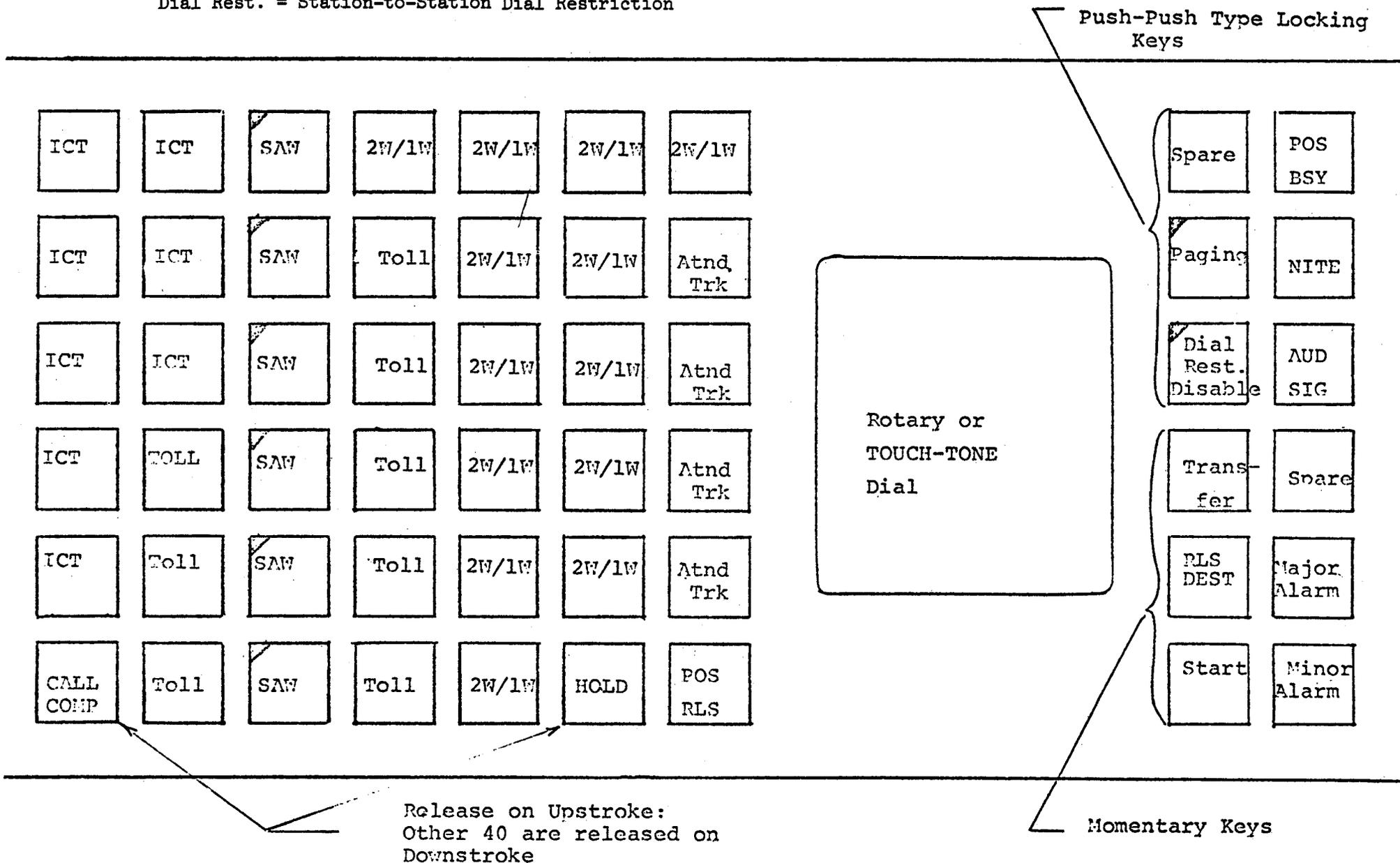


Figure 2 Proposed "Large" Console For 802A

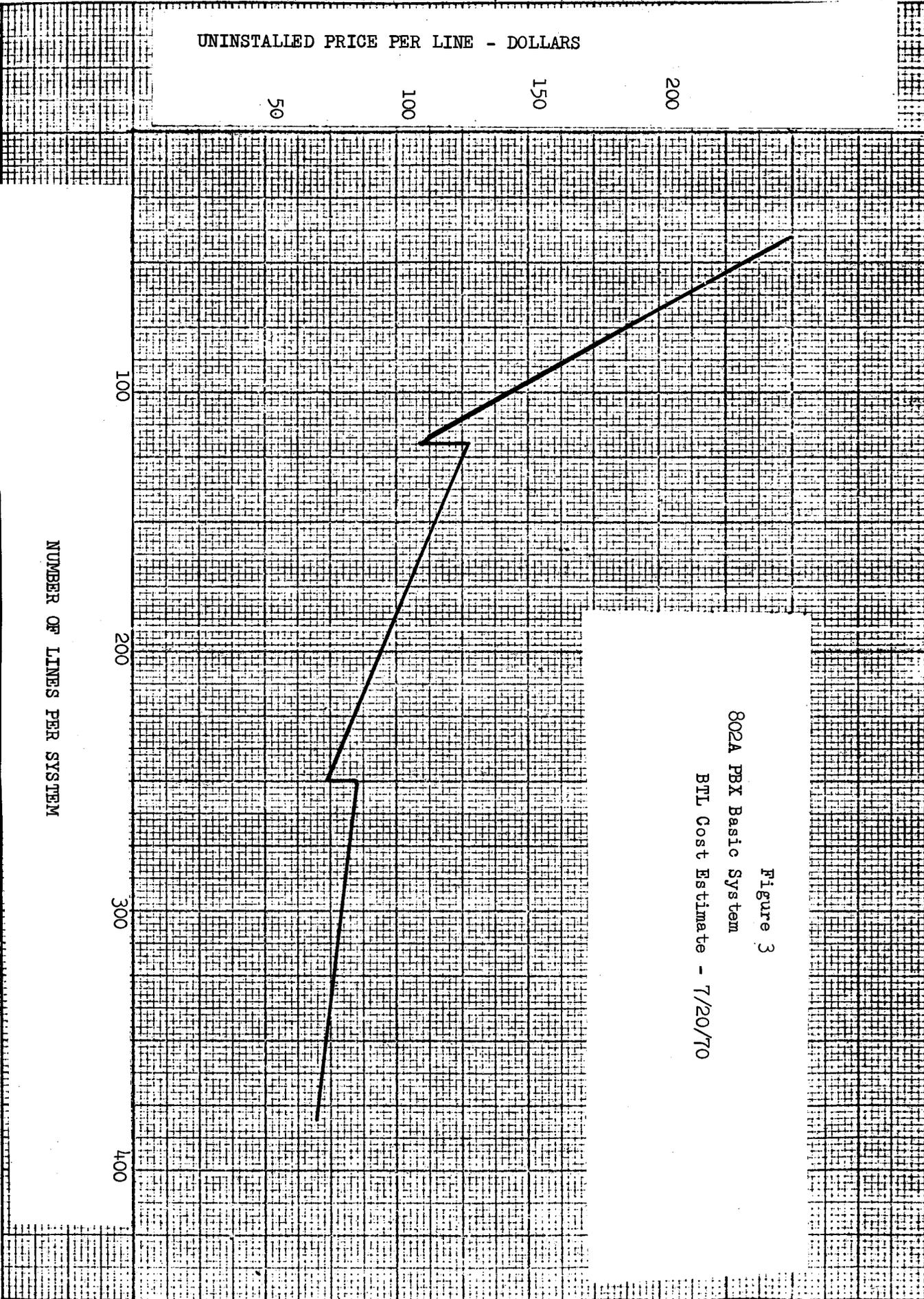


Figure 3
802A PBX Basic System
BTL Cost Estimate - 7/20/70

NUMBER OF LINES PER SYSTEM

UNINSTALLED PRICE PER LINE - DOLLARS