Schafer 900 Series
Broadcast Automation Systems

OPERATORS MANUAL

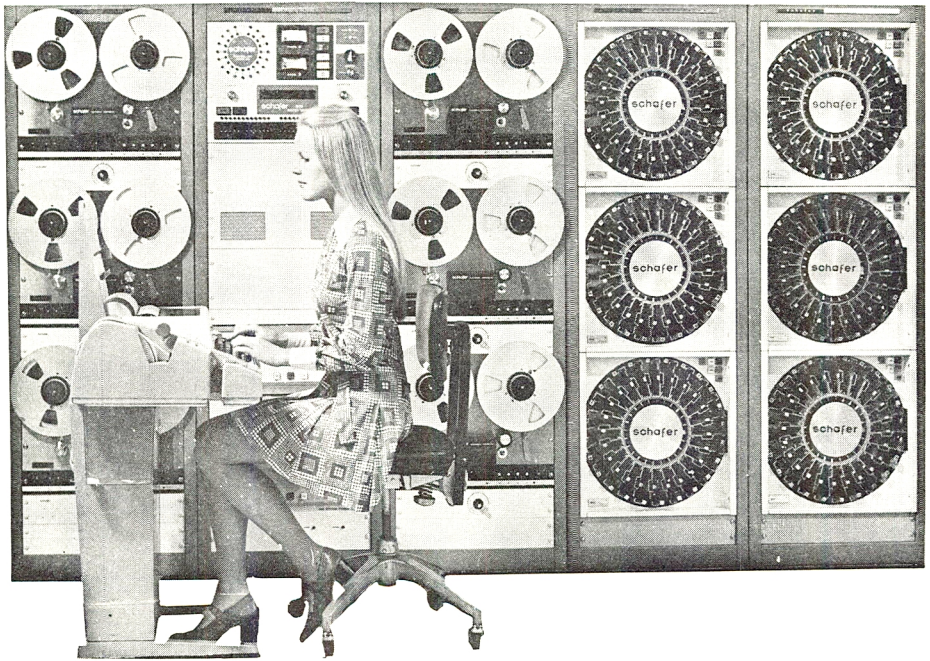
SCHAFER 900 SERIES
AUTOMATION BROADCAST SYSTEM

USERS MANUAL

FOR THE

903 SYSTEM

901 CONTROL UNIT
903 KEYBOARD AND DISPLAY UNIT



903 AUTOMATION BROADCAST SYSTEM

PREFACE

Your Schafer Series 900 Broadcast Automation System represents the latest advancement in radio broadcasting automation technology. Automation, however, does not replace the requirement for the trained and knowledgeable programmer; he is still indispensable for successful operation of the system.

The 900 system will perform only as you program it; but when properly programmed, it will faultlessly advance through thousands of playing events on schedule throughout the day—with no operator intervention. And it will do this day in and day out for years, as it is constructed of the finest components available to modern electronics.

To program your 900 system successfully, you must learn the basic rules contained in this manual. The 900 system will then be at your command for the most efficient and versatile broadcast scheduling your listeners can desire.

TABLE OF CONTENTS

LIST OF TABLES

INTRODUCTION

SERIES 900 SYSTEM DESCRIPTION

The Series 900 System comprises a combination of audio source devices and control units which allow automatic radio transmission of various audio selections in accordance with a preprogrammed schedule. As many as nineteen audio devices may be included in a standard 900 system; the system also provides capability for up to 29 audio devices—including reel to reel tape decks, as well as live studio and network inputs.

Control electronics for the systems are contained in the following Schafer units: Model 901 Control Unit, Model 903 Keyboard and Display Unit, Model 903 Memory Unit, and Model 903 Random Audio Source (RAS) Control Unit. The system also includes a monitor speaker chassis (Cue Speakers), a Power Supply and various optional units for special control functions.

The Model 901 Control Unit interfaces with the audio devices and directs selected audio to the Transmitter and the monitor speakers. The 901 completely controls and monitors the various audio devices of a modern broadcast automation system, and is operable by front panel control, as well as automation command inputs from the Model 903 Memory Unit. An auxiliary System Remote Unit is also available for duplicating various front panel functions and allowing operator control of the 901 from a remote location.

The Model 903 Keyboard and Display Unit, in conjunction with the Memory Unit and RAS Control Unit, represents the most up-to-date advancement in automation broadcasting systems. Through utilization of techniques and circuits contained in modern digital computers, the 903 provides total flexibility in scheduling all events in a 24-hour day of radio broadcasting. Significant features of the 903 system include the following:

- Solid-state memory provides programming capacity for scheduling 2048 events. Events are scheduled on basis of both time of day and sequence.
- System controls up to 19 random access and sequential audio sources. Look ahead feature provides spot programming and precueing for random access devices.
- Sequential events can be scheduled in groups, with almost unlimited flexibility as to number of groups and number of events in each group.
- Ten programmable auxiliary functions provide automatic control of station operations.
- Keyboard provides operator interface for simplified programming, with display to show data entries as they are made.
- Program changes can be made while system is in operation.
- Keyboard display allows operator surveillance of all programmed events.
- Crystal controlled real-time clock provides numeric time of day readout in hours, minutes and seconds.

OPERATING FEATURES

Closed Loop Control

If, for any reason, a playback is incapable of playing when called, this is sensed in 1/3 second and the next event scheduled plays. Also, should a playback go out of play (such as tape breakage) the system will immediately go on to the next event.

Silence Sense

If no audio from a playback deck is sensed, the system automatically goes on to the next event scheduled, after an adjustable delay.

Cue

System can monitor any channel not on the air with Monitor Speakers as well as VU meters. Cue level controls are provided for all audio devices.

Switch Tone Sensing

Individual 25Hz and 150Hz sensing allows multi-audio sources to be aired. Automatic cueing when loading new tapes is provided.

Audio Clock (Optional)

For time announcements, pre-recorded reel to reel, cartridge or cassette playback decks are provided.

Temperature (Optional)

Automatically sensed and pre-recorded tempera- tape playback is automatically cued and is always ready to play when called for by control unit.

Network Join

This is controlled a real time basis. A choice of fade-in of network fill or fade-out of music is offered. Fill deck may be reel to reel or cartridge.

GENERAL SYSTEM OPERATING PROCEDURES

SYSTEM POWER

The 900 System is equipped with a single power supply which generates dc power (5 VDC, 12 VDC and 24 VDC) for the Schafer Control units. In addition, the system contains a self-charging battery supply for the control electronics. The battery supply provides power for the 903 Memory Unit and the crystal clock, thus preventing the loss of real-time synchronization and memory program data in the event of a power line shutdown.

The power supply functions as a feed-through for 120 VAC power to the audio decks. Six AC outlets on the power supply rear panel are provided for audio deck power. Four of these outlets (AUX power) are switched on and off by the front panel AUX power switch; the remaining two outlets energize directly from the main power line. A circuit breaker at the power supply rear panel controls the DC output to the battery supply, which is contained in the Cue Speaker chassis. A circuit breaker at the rear of this chassis controls DC power for the Memory Unit and crystal clock.

Turn On Procedure

a. Turn on circuit breaker at power supply rear panel. Check that front panel lights are on (5V, 12V, 24V).

b. Switch front panel AUX power ON switch.

c. Turn on battery supply by pressing button at rear of Cue Speaker chassis; indicator lamp lights.

d. Turn on Audio sources.

CUE LEVEL

A small panel is provided below every reel to reel tape device that contains a coaxial control knob (PLAYBACK LEVEL), which adjusts the output cue level. The small knob controls the left channel; the large knob controls the right channel. Carousels and cartridge devices are normally equipped with rear panel or internal cue level adjustments.

Adjustment Procedure

a. Turn on audio device and, if applicable, place in Cue mode.

N O T E

Only device being adjusted must be playing.

b. Place MONITOR switch on 901 Control Unit at CUE position (CUE indicator lights and audio is heard from Monitor Speakers).

c. Set tape at cue tone and observe VU meters on 901 panel.

d. Adjust PLAYBACK LEVEL knob (or applicable cue control) for proper output level. (Normally, 0 db.)

AUDIO CLOCK

The Audio Clock normally comprises two tape decks, one with recorded even minutes and the other with recorded odd minutes. Alternate decks are advanced once every minute by the Digital Clock in the 903 Unit. The advances occur at 30 seconds past the minute; hence, when the Audio Clock is called, the time played will be to the nearest minute. The internal electronics prevent the Audio Clock from advancing again in the same minute that it is called to play.

Synchronization Procedure

a. Set Digital Clock to real time by using applicable procedure in 903 section in manual.

b. Set 901 MONITOR switch at CUE.

c. Turn on Audio Clock, and listen to output on Monitor Speakers.

d. Advance Audio Clock tape reels for proper synchronization with Digital Clock. The Audio Clock should play the next track at 30 seconds past the minute.

AUDIO SOURCE IDENTIFICATION

The number and types of audio sources in a 900 system are selected on the basis of individual station requirements. Table 1 should be completed for identification of audio sources.

TABLE 1

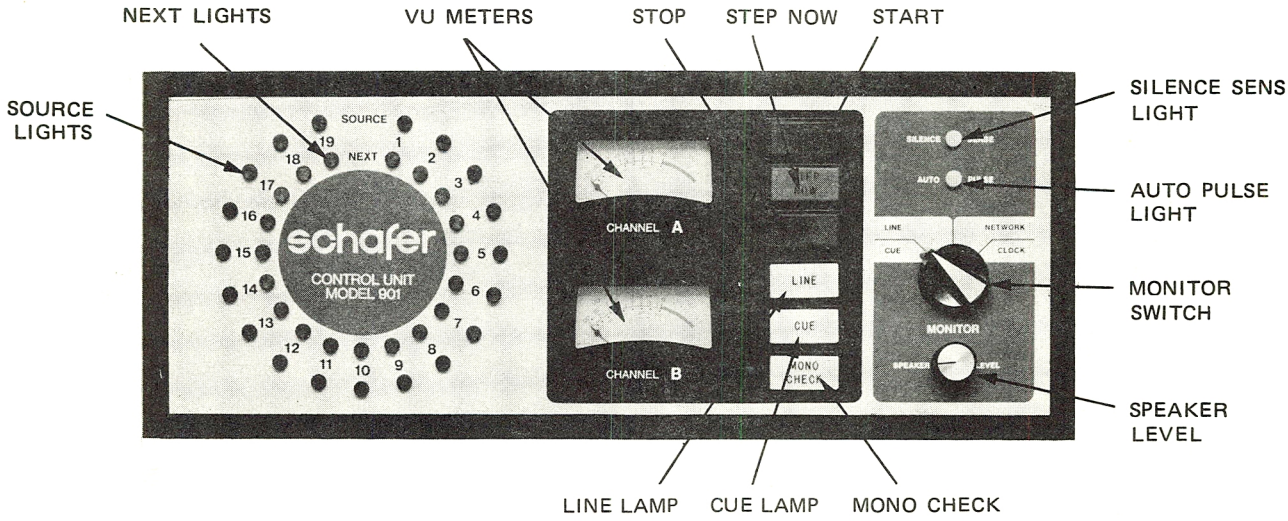
Number	Type	Selection
1		
2		
3		
4	single play cart	
5		
6		
7		
8		
9		
10		

Number	Type	Selection
11	Current Reel	
12	Recurrent Reel	
13	400 Gold Reel	
14	Reel	
15	100 Gold Reel	
16		
17		
18		
19		

901 CONTROL UNIT

OPERATING INSTRUCTIONS

The Schafer Model 901 Control Unit includes the equipment and circuitry to control and monitor the various audio source devices of the 900 system. These device control functions include starting, stopping, cuing, silence sensing, level setting, monitoring and stero phase checking. The 901 Control Unit is designed to operate in conjunction with the Model 902 Switch Memory, the Model 903 Keyboard Memory, or the Model 904 Manual Control Unit, any of which provide the programming sequencing of the audio devices to be controlled.



901 CONTROL UNIT

START, STOP AND STEP NOW SWITCHES

DESCRIPTION

Three pushbutton switches are used for controlling the system operation. Each switch contains an internal light for the corresponding mode of operation: START is green; STOP is red; STEP NOW is amber.

START AND STOP OPERATIONS

When power is applied to the system, the STOP light illuminates (after a brief power-up delay), indicating that the system is ready for operation but in the Stop mode. Pressing the START pushbutton then places the system in the Run mode, for controlling an audio device that is being played on the air. In the Run mode the STOP light is off and the START light is on.

The system, while in the Run mode, can be placed in the Stop-Request mode by depressing the STOP pushbutton. This illuminates both the START and the STOP lights, and causes the system to stop playing at the end of the current selection.

STEP NOW

The STEP NOW pushbutton can be depressed anytime the system is playing to manually advance to the next scheduled audio device. The system changes sources without waiting for the end of the present selection. The STEP NOW can also be pressed after the system is placed in a Stop-Request mode by the STOP pushbutton. This action turns off the system without waiting for the end of the current selection.

SOURCE AND NEXT LIGHTS

DESCRIPTION

Concentric arrangement of 19 SOURCE lights (green, outer circle), and 19 NEXT lights (amber, inner circle). Lights are identified 1 through 19 to represent the audio sources listed in Table 1.

SOURCE LIGHTS

In operation, an illuminated SOURCE light indicates the audio source that is presently on the air.

Two or more lights can be lit simultaneously to show that more than one source is playing.

NEXT LIGHT

An illuminated NEXT light indicates the audio source that is scheduled to play next. In certain cases two lights may be lit, one steady and one blinking. The steady light represents the next source, and the blinking light the source to follow.

VU METERS AND MONITOR SWITCH

DESCRIPTION

Two VU meters labelled CHANNEL A and CHANNEL B read from -20 db to +3db. Meters monitor stereo output from audio source selected at the MONITOR switch.

MONITOR SWITCH WITH LINE AND CUE INDICATORS

Four-position rotary switch selects audio for VU meters and Monitor Speakers.

LINE position selects line audio (i.e., on the air) for monitoring by VU meters and Monitor Speakers. Normal audio level output is 0 VU. The LINE indicator lamp (white) illuminates when the switch is in this position.

CUE position selects for monitoring all audio sources—except that source which is on the air and network. The CUE indicator lamp (white) illuminates when the switch is in this position.

NOTE: The CUE position is normally used to set the output level on tape decks that are scheduled to play, but are not presently playing. When the switch is placed in this position, the VU meters and Monitor Speakers are connected to the cue bus, which is fed by all audio sources that are not on the air. Hence, to accurately adjust the output level from a given source, only that source should be turned on for cuing.

NETWORK position causes the network audio to be superimposed onto the cue bus. No other audio source can be in cue if it is desired to monitor network by itself.

CLOCK position places the audio clock on the cue bus line.

MONO CHECK SWITCH

DESCRIPTION

Pushbutton switch is used for checking response of Channel A and Channel B stereo on a monaural receiver.

PROCEDURES FOR MONAURAL CHECK

a. Place MONITOR switch at either LINE or CUE, in accordance with the audio source to be checked.

b. Press MONO CHECK pushbutton and observe VU meters. Pressing the pushbutton normally causes some change in meter reading. However, the VU meters indicate that the audio channels are out of phase if there is a marked and rapid decrease in output level.

SILENCE SENSE LIGHT

DESCRIPTION

The SILENCE SENSE light is driven by a protective circuit that prevents the loss of line audio if there is no output from the audio source, e.g., an accidentally erased tape. If the source output drops below a certain level (silence level), and is not recovered within a preset period (up to several seconds), then the system automatically advances from the present source to the next scheduled source. The present source continues playing if normal audio is recovered within the preset delay period. The SILENCE SENSE light comes on whenever the source audio output falls below the silence level. The light goes off when audio is recovered, or when a source change occurs.

AUTO PULSE LIGHT

This white light comes on momentarily to indicate that the line audio is changing from the present source to the next scheduled source.

SPEAKER LEVEL ADJUSTMENT

This potentiometer adjustment sets the audio level at the Monitor Speakers, but does not affect the VU meter levels.

903 KEYBOARD AND DISPLAY UNIT

OPERATING INSTRUCTIONS

The 903 Keyboard and Display Unit is the principle control for the 903 System. The unit includes a 16-character keyboard for operator usage in entering programs into memory, and a display panel which shows the program entries at individual memory locations. The display panel also contains a numeric readout of real time in hours, minutes, and seconds, which is driven by the system's crystal controlled clock. The 903 Keyboard and Display Unit provides total flexibility in programming audio devices for a complete 24-hour day of radio broadcasting.

903 KEYBOARD AND DISPLAY UNIT

903 MEMORY CONFIGURATION

GENERAL

The information required to control operating events in a 24-hour day of radio broadcasting is contained in the 903 memory. This information, or data, is programmed into memory from the keyboard.

The 903 memory contains 2048 locations, which are divided into two basic sections or files. The format file stores data to control format events, and the time file stores data to control time events. The time file is further divided into AM and PM sections, for morning and afternoon programming.

Each memory location can contain a data word that specifies and controls a specific event. If no data is programmed at a specific location, then no event occurs when that location is accessed; the operating sequence simply advances to a subsequent location.

Memory locations are identified by addresses. Each location has a unique address which allows entry to it from the keyboard and the operating control logic. Memory addresses are four-digit numbers, with a fifth digit modifier that identifies the section of memory: Format, AM, or PM. Table 1 provides a complete list of 903 memory addresses.

FORMAT FILE

The format file contains 400 locations, with addresses 0000 through 0399; the format file modifier digit is 2. The file is divided into four operational groups, with starting addresses 0000, 0100, 0200, and 0300. Format events are normally performed sequentially within a

given group; however, a special function command allows the operation to be transferred between groups, as desired.

TIME FILE

The time file consists of AM and PM sections, with a discrete memory location for every minute of the day. The time modifier digits are 0 for AM, 1 for PM. Addresses in this file are arranged to correspond with the minutes of the day. For example, the event controlled by data at address 1200 AM (0) is performed at midnight, while the event controlled by data at address 1200 PM (1) is performed at noon.

MEMORY DATA

Five digits of data are stored at each memory location to control the associated event. Four digits specify the event; the fifth digit is an action modifier.

The basic data is provided by two digits that specify whether to play an audio device or perform a function, e.g., start, stop, etc. As shown in table 2, the numbers 01 through 29 call for audio devices while the numbers 30 through 39 call for functions. The two remaining digits elaborate on this basic data. When a random access audio device is specified, the two remaining digits can specify a particular cartridge or slot in the device. When a function is specified for performance at a particular minute of the day, the two remaining digits can further define the time of function to within a second of the minute.

The action modifer specifies one of three things: One, whether to perform the event next, that is, upon completion of the current event (NEXT modifier). Two, whether to perform the event now, that is, on a specified

second of the present minute, and before the current event is completed (NOW modifier). Three, whether to link this event to the following event (LINK modifier).

TABLE 1. MEMORY ADDRESSES

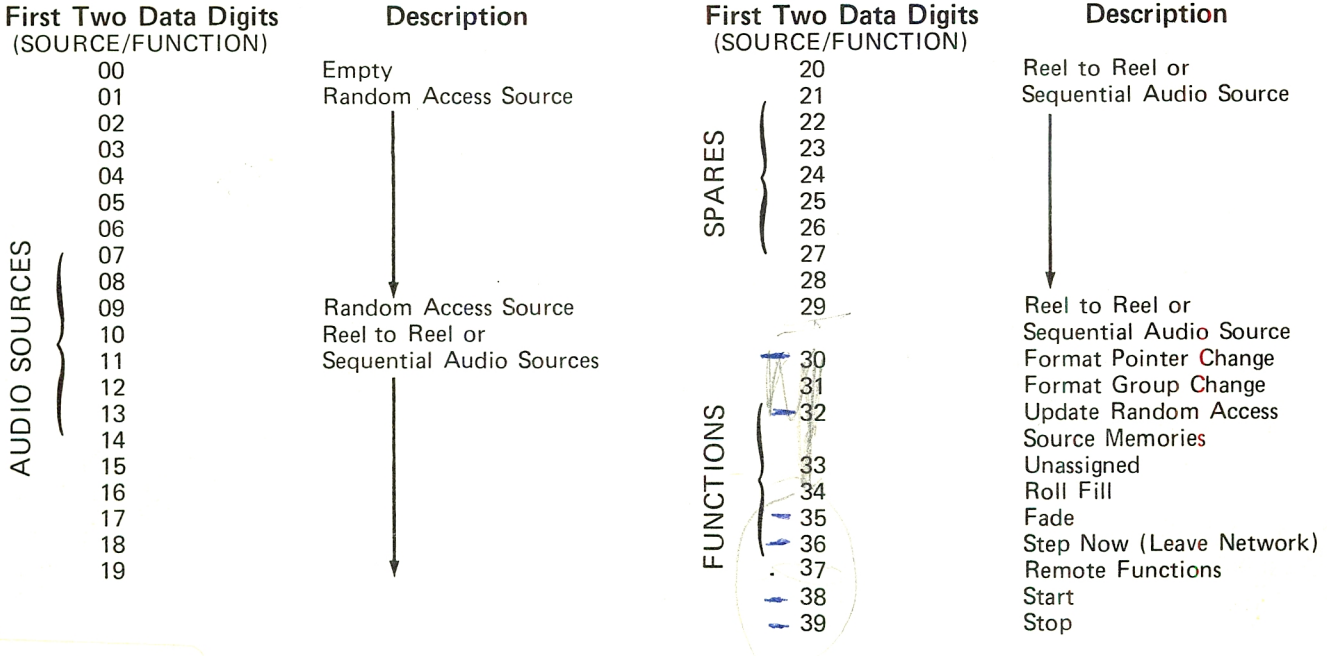
Format File Addresses

0000	FOR(2)	Group 1
0099	FOR(2)	
0100	FOR(2)	Group 2
0199	FOR(2)	
0200	FOR(2)	Group 3
0299	FOR(2)	
0300	FOR(2)	Group 4
0399	FOR(2)	

Time File Addresses

12:00 AM(0)	Morning Selections
12:59 AM(0)	
01:00 AM(0)	
11:59 AM(0)	
12:00 PM(1)	Afternoon Selections
12:59 PM(1)	
01:00 PM(1)	
11:59 PM(1)	

TABLE 2. AUDIO SOURCE AND FUNCTION DATA



BASIC OPERATING EVENTS

GENERAL

All events performed by the 903 system are controlled from memory in two basic ways. Format events are controlled by data contained in the format file; time events are controlled by data contained in the time file. Operation between files normally ping-pongs back and forth in accordance with the programmed instructions.

FORMAT EVENTS

Format events comprise the basic music selections of the radio station. These events are normally performed sequentially, under the control of the format file. In the file, a memory pointer keeps track of the operation; the pointer advances incrementally through the file, pointing to the next event to be performed as each event is completed. Thus, the format sequence normally proceeds through incremental memory locations, until it is interrupted by either a function command or a time event schedule.

TIME EVENTS

Time events are performed on the basis of real time, and controlled by the AM and PM time file. The time file uses the digital clock as a pointer to access sequential memory locations on a minute-by-minute basis with real time. All memory locations that do not contain data (zero data) are skipped over, thereby causing the time pointer to advance ahead to real time if no event is ready to be played. When the time pointer is ahead of real time, the operation switches to the format file at the location of the file pointer.

A time event action schedule occurs when a memory location containing data is accessed

by the time pointer, and the pointer is equal to or behind real time. Time events have priority over format events. Thus, when a time schedule is encountered, the normal format sequence is interrupted for the time event. This interruption is normally programmed to happen after completion of the present format selection, that is, the next event.

Because only one time event is programmed within a given minute, real time falls behind the time pointer, if the scheduled event takes less than a minute to complete. Operation then switches to the format file immediately upon completion of the time event. However, real time advances ahead of the time pointer, if the scheduled event takes more than a minute to complete. In this case, all subsequent programmed events in the time file, up to real time, must be completed before operation switches to the format file. That is, operation remains in the time file so long as events are scheduled which are behind real time.

When a function is programmed for performance on the basis of real time, the function is executed on the exact minute and second of schedule, irrespective of any event backlog in the time file. Backlogged time events are performed upon completion of the function, starting with the earliest unplayed schedule and proceeding to real time. Operation switches to the format file when the time pointer again advances ahead of real time.

LINKED EVENTS

GENERAL

Links are used for tying events together so they cannot be interrupted, e.g., an introduction with music. Two or more events can be linked together; however, events must follow in the same memory file: format with format, and time with time. Any number of events within the same file can be linked.

FORMAT LINKS

In normal operation, time events take precedence over format events and interrupt the format sequence whenever time schedules occur. This normal procedure can be modified by linking together format events which should not be separated. If a time insertion occurs during a series of linked events, then the time event must wait to come on until after all linked selections are completed. Hence, if an audio source is programmed with a following linked source, no time insertion can occur between the two sources.

TIME LINKS

Links are used in the time file for allowing real time to fall behind the time pointer. In normal operation, this condition causes an immediate switch of control from the time file to the format file. However, this normal operation requires modification under certain conditions; for example, when a short (less than one minute) time selection is followed by a second time selection. An interruption in audio output might occur if the two selections are not linked. When the two selections are linked, they follow each other without interruption even through real time is behind the time pointer.

GENERAL

Functions are specified when the first two digits of data are 30 through 39 (see table 2). The remaining data then provides additional instructions for implementing the function. These additional instructions can specify performance on an exact second within the minute, or they can be used as memory address pointers for changing the sequence of operating events, depending upon the particular function performed.

Functions can be programmed in the format file and the time file, although certain functions are used exclusively in one file or the other. Format functions are accessed by the format file pointer and performed in the normal sequence of events. Time functions are accessed on the basis of real time in the time file, and are normally programmed to commence on a particular second within the minute of address.

FUNCTION 30 – FORMAT POINTER CHANGE

Basic control in the format file is provided by the format pointer, which increments from one memory location to the next as events are completed. For example, if the current event is controlled at address 1 (0001), then the next event is automatically at address 2, and then 3, and so on. Function 30 is used to terminate this automatically incrementing series, and direct the memory pointer to any location within the file group of 100 addresses.

The use of function 30 is described in the following simple example. Assume three audio devices (A, B, and C), which operate sequentially and then recycle back to A. In the format file, the pointer automatically increments from A to B to C, whose addresses are contained in subsequent locations. However, the pointer must be instructed to go back to A (rather than continued to D) after the C selection. Therefore, function 30 is programmed at the memory location following C. The two-digit memory address of the A instruction is also given with the function 30 data. Now, as the pointer increments from the C address to the next location, the function instructs it to go back immediately to the A address.

Function 30 can also be used in a special case a link action modifier. When function 30 is programmed with a link, the pointer is transferred and linked to the next audio source in the time file, starting at the present real time. This special function allows system operation to be transferred from the format file to the time file in a linked condition. The scheduled event in the time file can be ahead of real time, since the time pointer starts at the present time and searches forward for an event to play.

FUNCTION 31 – FORMAT GROUP CHANGE

The format file is divided into four groups of 100 addresses. Group starting addresses are: 0000, 0100, 0200, and 0300. In normal operation, the memory pointer increments through all addresses in a given group. Function 30, previously described, allows pointer changes within a group, but does

not allow jumps from one group to the next.

Function 31 is used to advance the pointer from any address to the starting address of any group. When function 31 is specified, the remaining data must be 00, 01, 02, or 03, to direct the pointer from the present location to the desired group. The pointer then advances sequentially in the normal manner, within the new group.

It should be noted that, unless a pointer change (function 30 or 31) is programmed in the format file, the pointer increments through all locations in the file irrespective of group boundaries. The pointer automatically recycles back to the starting address (0001) after completion of the last event of address 0399. The format file can be programmed with a series of 400 sequential events, although this is not the normal operating requirement at most broadcast stations. A practical operating situation normally requires the division of sequential events into two or more groups of several events each. The format file is divided into four groups to accommodate this requirement, with function 31 used as the pointer change between groups. Subgroups are programmed within a group of 100 addresses, by the function 30 command.

FUNCTION 32 — RANDOM AUDIO SOURCE MEMORY UPDATE

In order to explain the use of function 32, a discussion is warranted on the method of cueing random audio sources. There are essentially two memories associated with each RAS.

One is the 903 system memory, containing the RAS source address number, 01 through 09, plus a spot number, e.g., 01 through 24 for Carousels. The second is a cue memory register that is associated with the particular Carousel. The cue memory register contains only the spot number, and controls the RAS cueing operation for the next event.

In normal operation, two things happen when a 903 memory location containing an RAS command is accessed. One, the Carousel turns on to play the event. Two, the 903 memory pointer automatically searches forward to find the next event in the file. The spot number of that next event is then transferred to the cue memory register, and, upon completion of the current event, the Carousel automatically cues to the desired cartridge. In this manner, the Carousel immediately precues the next event after every event that is played.

Assume that a Carousel is cued for the next event, but a change of program is made in the 903 memory; that is, the event spot number is changed. When the 903 memory is reprogrammed, it is not automatic for the cue memory register to also update with the new information. The cue memory register must be told that a change is made, so that the Carousel can rescue the new event. Function 32 is used for this purpose. The function causes the file pointer in the 903 memory to search forward and find the next scheduled RAS event. It then causes the Carousel to recue the spot number of that event, if the spot number is different than the present cue position of the Carousel. Function 32 should be programmed at the first available memory location between the current event and the RAS event, to allow sufficient time for the physical operation of the Carousel to cue.

With function 32 as well as normal operation, the search forward feature of the 903 memory operates within the same file as the current event. The entire format file is searched for a next event, while the time file is searched forward up to 12 hours, depending on the location of the real time pointer. For searching purposes in the time file, the day is divided into four 6-hour segments: 12:00 AM to 5:59 AM, 6:00 AM to 11:59 AM, 12:00 PM to 5:59 PM, and 6:00 PM to 11:59 PM. The memory search includes all remaining locations in the segment containing present real time, plus the entire next segment. The search thus extends forward a minimum of six hours and maximum of twelve hours. If no RAS event is found in the file search, the system assumes that none is scheduled and turns off the Carousel.

Additional Features of Cueing.

The previous paragraphs explain how a Carousel is cued automatically, both in normal operation and on command of function 32. In addition to these methods, a request for cueing can be initiated manually at the Carousel itself, or via the system remote control panel. At the Carousel, the operator initiates a cue cycle by placing the Carousel in the Manual mode and then switching it back again to Automatic. This request causes the memory pointer to search ahead for the next spot number. The Carousel then cues to the spot by traying out, rotating to the cartridge slot, and traying in again. Safety features are designed into the Carousel control circuits to prevent

false cueing. Examples: 1) a spot is programmed that does not exist, e.g., spot 25 of a 24-cartridge Carousel, and 2) no Carousel is scheduled in the memory file. In these cases the Carousel attempts to cue, but stops with the tray out. However, the memory file is automatically searched again every minute thereafter. The Carousel thus cues to the proper slot within one minute after the program is corrected.

Another built-in safety feature prevents the Carousel from cueing to an empty slot or a slot where the cartridge is not properly inserted. In this case the Carousel rotates to position and attempts to tray-in. But, finding no position available, the Carousel trays out, starts rotating, and stops immediately. When a cartridge is properly inserted, and the operator initiates a cue cycle by placing the Carousel in the Manual mode and then switching it back again to Automatic, the unit rotates around to position and trays in.

FUNCTION 34 — ROLL FILL

This function is programmed in the time file and linked to address 90 (0090) in the format file. Format 90 is programmed with the address of an audio device, reel to reel or cartridge, which contains a fill deck of music with a known playing duration. At the time of function, the fill deck starts dead rolling, that is, rolling but not playing on the air. The current event plays to the end, and then the fill music comes on the air. Because the time that the fill deck starts rolling is known, and because the duration of the fill deck is known, the moment of the next event is calculated and also precisely known. For example, if the fill deck is three minutes and 45 seconds long, and if function 34 is

scheduled at the 56th minute and the 15th second into the hour, then the next event starts precisely at the beginning of the next hour.

Function 34 is linked to format file address 90. Therefore, a time schedule cannot preempt the fill event once the deck starts rolling. The event following the fill music can be scheduled at either the format file or the time file, through application of all normal programming rules. Format addresses 91 through 94 are reserved for subsequent schedules in the format file.

FUNCTION 35 – FADE

This function is programmed in the time file and linked to address 95 (0095) in the format file. At the moment of a function 35 schedule, the current event is turned off, that is, faded out. (A fade delay control in the 901 control unit can be adjusted from less than a second up to a few seconds.) The event scheduled at format file address 95 then plays. Format addresses 96 through 99 are reserved for subsequent schedules in the format file.

FUNCTION 36 – STEP NOW (LEAVE NETWORK)

This function performs the same operation as the STEP NOW pushbutton on the 901 control unit and system remote panel. That is, it terminates the current event and starts the next event immediately. Function 36 is additionally used for leaving the network.

It should be noted that the network (or studio, etc.) is programmed as any other audio device in the 903 system, and be joined in the same way as an audio schedule. The network can be joined directly from the time and format files, although most typical network joins are indirect via function 34 (roll fill) or function 35 (fade). In order to leave the network, however, function 36 must be programmed at the desired time. Function 36 returns the system control back to the next scheduled event in memory.

FUNCTION 37 – REMOTE FUNCTION

The standard 903 system includes 10 solid state drive circuits (expandable to 100 circuits). These circuits can be used to engage relays for controlling remote functions, such as starting and stopping the transmitter, turning lights on and off, etc. Function 37 is the identifier for the remote function drivers. The remaining two data digits select a particular driver for the desired function (00 through 09).

FUNCTION 38 – START

This function performs the same operation as the START pushbutton on the 901 control unit. The function is used to start the system at any specified time of day.

FUNCTION 39 – STOP

This function performs the same operation as the STOP pushbutton on the 901 control unit. The function is used to stop the system at any specified time of day. When the function 39 is addressed, the system stops playing after completion of the current event.

DISPLAY PANEL

GENERAL

The keyboard display panel contains the readouts of memory address and associated data. These readouts are active for programming the system, as well as during normal operation. While the system is operating, the display normally shows the address and data of the next scheduled event. During programming, the display provides an instantaneous visual indication of all actions performed at the keyboard.

The display panel is designed so that the operator can tell the next digit to program when information is being entered at the keyboard. This is accomplished with a blinking cursor, which causes the corresponding display to blink. As each digit of information is entered, the blinking cursor moves one display to the right, thereby informing the operator of the next digit to enter.

ADDRESS DISPLAY

The ADDRESS display contains five digits, designated as follows: one for DAY, two for HRS (hours), and two for MIN (minutes). Since only four digits are required to address memory on present systems, the first display (DAY) should be ignored; this digit is reserved for expanding the addressing capabilities of future systems that contain digital cassettes. Hence, only the four HRS and MIN displays are of present interest to the operator. These show the four-digit address code of the selected memory location.

In addition to the HRS and MIN displays, the ADDRESS section contains a 3-level

projection display that shows the memory file that is selected for addressing: AM and PM designate the time file for morning and afternoon time events; FOR designates the format or sequential event file. Although the address displays are grouped and designated by hours and minutes, these designations are applicable only with time event addresses (AM or PM), in which cases a colon is shown separating the HRS and MIN digits. As given in table 1, the addresses for time events range from 1200 to 1159 in both AM and PM memory files, allowing each address code to comply exactly with a corresponding minute of the day. However, when a format address is selected, the colon is not shown. The ADDRESS display is then considered a four-digit (address) number ranging from 0000 to 0399.

DATA DISPLAY

This display shows the four digits and action modifier which are contained at the memory address for controlling the associated event. A summary of events and data readings programmed at both the time file and the format file is provided in table 3.

SOURCE/FUNCTION — This display shows the first two data digits, which indicate the basic operation to be performed.

1. Digits between 01 and 29 always relate to an audio SOURCE. With these digits, the programmed event is an audio selection from the addressed source (see table 2).

(continued)

2. Digits between 30 and 39 always relate to a FUNCTION, e.g., start, stop, etc., as given in table 2.

SPOT/SECONDS — This display shows additional data relating to the performance of the SOURCE/FUNCTION data. The two displays combine to show the four digits of instruction data.

Action Modifier — This three-level projection display reads NOW, NEXT, or LINK. The Action Modifier should be read and programmed in accordance with the following general rules:

1. NOW indicates that a time event (AM or PM) is further modified to occur at a specific second within the selected minute. NOW is entered by a 2 at the keyboard.

2. NEXT indicates that the programmed event (time or format) is to occur after completion of the current selection, that is, in normal sequence. NEXT is entered by a 0 at the keyboard.

3. LINK indicates that the next audio selection in the same memory file is linked to this event. LINK is entered by a 1 at the keyboard.

TABLE 3. SUMMARY OF DATA PROGRAMS

ADDRESS	SOURCE/FUNCTION	SPOT/SECONDS	ACTION MODIFIER	REF.
Format File or Time File (FOR: AM or PM)	Random Access Source (01 thru 09)	SPOT is cartridge or spot within RAS device; 01 thru 24 for Carousels; 00 thru 99 for spotters	NEXT or LINK	903-3 thru 903-10
Format File or Time File (FOR: AM or PM)	Reel to Reel or sequential source (10 thru 19)	Inoperative/zero	NEXT or LINK	903-3 thru 903-10
Format File or Time File (FOR: AM or PM)	Function 30 (Format Pointer Change)	Address of memory pointer change (00 thru 99)	NEXT or LINK	903-11
Format File or Time File (FOR: AM or PM)	Function 31 (Format Group Change)	Address of memory pointer to first location in another group	NEXT	903-12
Time File (AM or PM)	Function 32 (Random Audio Source Memory Update)	Exact SECOND — Requires NOW as modifier	NEXT or NOW	903-13
Format File (FOR)	Function 32 (Random Audio Source Memory Update)	Inoperative/zero	NEXT or NOW	903-13

TABLE 3. SUMMARY OF DATA PROGRAMS (Cont'd)

ADDRESS	SOURCE/FUNCTION	SPOT/SECONDS	ACTION MODIFIER	REF.
Time File (AM or PM)	Function 34 (Roll Fill)	Exact SECOND of event within minute of schedule.	NEXT or NOW	903-16
Time File (AM or PM)	Function 35 (Fade)	Exact SECOND of event within minute of schedule.	NEXT or NOW	903-17
Time File (AM or PM)	Function 36 (Step Now-Leave Network)	Exact SECOND of event within minute of schedule.	NEXT or NOW	903-17
Time File (AM or PM)	Function 37 (Remote Function)	Identifies desired remote function (see table 4). Also exact second of event if a NOW is programmed.	NEXT or NOW	903-18
Time File (AM or PM)	Function 38 (Start)	Exact SECOND of event within minute of schedule.	NEXT or NOW	903-18
Format File (FOR)	Function 39 (Stop)	Inoperative/zero	NEXT	903-18
Time File	Function 39 (Stop)	Exact SECOND of event within minute of schedule.	NEXT or NOW	903-18

TABLE 4. REMOTE FUNCTIONS

DATA DIGITS FUNCTION	DATA DIGITS SPOT/SECONDS	REMOTE FUNCTION
37	00	
	01	
	02	
	03	
	04	
	05	
	06	
	07	
	08	
	09	

KEYBOARD CONTROLS

GENERAL

The keyboard controls provide the operator interface for entering data into the 903 system memory, and for controlling the readout of memory to the data display panel. Keyboard controls comprise a 16-key keyboard, as well as five additional controls (four pushbutton switches and a lever.). The functions of all keyboard controls are discussed in the following paragraphs.

KEYBOARD SWITCH

This switch activates the keyboard, and must be pressed on before any programming functions can be performed.

N O T E

In order to prevent inadvertent keyboard entries while the system is in operation, the KEYBOARD switch should be placed on only while programming functions are being performed. During normal system operation, the NEXT switch should be on.

NEXT SWITCH

When pressed, this switch produces a display of address and data of the next memory location within the file that has current control of the system. If current operation is in the format file, the display shows the next scheduled event in the format file; if current operation is in the time file, the display shows the next scheduled event in the time file.

OTHER SWITCH

When pressed, this switch produces a display of the address and data within the

file opposite the one currently controlling the system. If current operation is in the format file, the display shows the next memory location in the time file from which an event may be scheduled. Conversely, if current operation is in time file, the display shows the next scheduled event in the format file.

AUTO Switch

This switch causes the display to show in succession all memory data at a scan rate determined by the DISPLAY RATE control.

NUMBER (0 through 9)

These keys are used for entering the information into the system. Both address and data information is entered as numbers 0 thru 9.

ENTER Key

This key is used to enter data from the data display into memory. When information is keyed into the system, the information is placed in a temporary storage register whose function is to drive the data display. When the ENTER key is pressed, the programmed data is written into the corresponding memory location and retained there; the data is then read from memory back to the storage register for driving the display.

N O T E

When the ENTER key is pressed, the data display momentarily turns off to indicate that data is entered into memory. After data entry, the blinking cursor is at the first digit of the SOURCE/FUNCTION display.

CLEAR Key

This key is used for clearing the display panel. The key must be pressed twice in

order to clear the panel completely; the first press clears the data display, and the second press clears the address display. The blinking cursor moves to the first digit of the SOURCE/FUNCTION display when data is cleared, and moves to the first digit of the HOURS display when address is cleared.

N O T E

The CLEAR key only clears the temporary storage register used for driving the display. It does not clear the memory. To clear the memory location, a zero is entered as the first data digit and the ENTER key pressed.

ADV (Advance) KEY

This key advances the address display to the next address. By pressing the ADV key, the operator avoids having to re-enter addresses when programming sequential memory locations.

ADV COL (Advance Column) KEY

When this key is pressed, the pointer searches forward in memory to find the next random access audio schedule. The address and data of this schedule are displayed on the display panel.

← (Left Arrow) KEY

The blinking cursor moves one digit to the left, every time this key is pressed.

→ (Right Arrow) KEY

The blinking cursor moves one digit to the right every time this key is pressed.

903 MEMORY UNIT CONTROLS

GENERAL

The 903 Memory Unit contains a subpanel with a toggle switch and two pushbutton switches. The subpanel is located inside the front panel and accessed by opening the 901 Control Unit Panel. This panel is opened by pressing and then releasing the lower left corner of the 901 panel; an alternate action latch inside the panel opens the panel.

CLOCK SET/RUN toggle switch. This switch controls the crystal clock. The switch is placed at CLOCK SET to stop the clock, and is placed at RUN for normal clock operation. (See Clock Set Procedure, p. 903-34).

CLEAR Memory pushbutton (located on side of subpanel). This pushbutton clears the entire 901 memory.

RESET pushbutton (located on top of subpanel near toggle switch). This pushbuttor
a) sets the time file pointer to real time,
b) sets the format file pointer to zero, and
c) stops any memory cycle that may be occurring at the time the switch is pressed.

ENTERING DATA

The operator, when entering data, may utilize alternative methods provided at the keyboard for selecting the memory address of data entry. Each method gives some advantage over the others for efficient programming, depending on the relationship between the present address shown at the keyboard display and the address to be programmed.

N O T E

The KEYBOARD switch must be turned on in order to operate the keyboard controls for programming the system.

The basic method of selecting a memory address is to enter the entire address at the keyboard. In order to do this, the blinking cursor must first be moved to the first digit of the HOURS display. The blinking cursor is moved to position by pressing the CLEAR key twice, or by pressing the Left Arrow key five times. When the blinking cursor is in position, the address is entered via the numbered keys. The address is a four-digit number, shown on the display, plus a fifth digit file selection modifier, as follows:

AM	is	0
PM	is	1
FOR	is	2

Once the address is entered at the address section of the display, the blinking cursor is advanced to the data section of the display. Data is then entered in accordance with the guidelines given in table 3.

NOTE

The ENTER key must be pressed in order to enter programmed data into the selected memory address.

If sequential memory locations are to be programmed, it is not necessary to completely enter each address by the basic method discussed above. After data is entered into the first address of the sequence, subsequent addresses are simply obtained by pressing the ADV key. Every time the ADV key is pressed, the address display automatically updates to the next address, and the blinking cursor moves to the first data digit for entering data.

If an existing program is to be modified, the NEXT and OTHER switches are particularly useful for obtaining memory addresses. The NEXT switch produces the next programmed address in the file that is currently displayed, while the OTHER switch produces the next programmed address in the opposite file. The operator can thus jump from one programmed event to another, without entering individual addresses or performing a sequential search through the file. Similarly, the ADV COL key obtains the address of the next random access audio scheduled. The operator can use this key effectively when making spot changes in random access events.

DATA ENTRY PROCEDURE

a. **Press KEYBOARD switch.**

b. **Enter address:**

By pressing CLEAR key twice to move blinking cursor to first address digit, followed by keying in the new address number: 4 digits plus 0 for AM, 1 for PM, or 2 for FOR. . .

Or . . . .

By pressing Left Arrow key five times to move blinking cursor to the first address digit, followed by keying in the new address . . .

Or . . . .

By pressing ADV key to obtain the next address . . .

Or . . . .

By pressing the ADV COL' key to obtain the next random access schedule in memory . .

Or . . . .

By pressing the NEXT or OTHER switches, and then pressing the KEYBOARD switch again.

c. **Enter data:**

By first pressing two keys for desired audio source number or function number.

Then . . . pressing two keys for desired spot number, or for seconds to be performed at an exact time.

Then . . . pressing 1 for LINK or 2 for NOW.

d. **Check display to make sure all entries are correct.**

N O T E

If an error is discovered, use CLEAR key or Left Arrow key to move blinking cursor back to the first digit in error, and re-enter all subsequent numbers.

e. Press ENTER key.

N O T E

When ENTER key is pressed, the keyboard display turns off momentarily, and the blinking cursor returns to the first digit of the data section. If the blinking cursor does not return to the data display, the entry may be held up due to a memory cycle conflict. This condition is corrected by pressing the RESET button on the 903 Memory Unit subpanel, and the pressing the ENTER key again.

f. Recheck the display to ensure that data is properly entered into memory.

N O T E

If an error is discovered at this point, the memory location must be cleared and then reprogrammed with correct data. Clear a memory location as follows:

1. If address is incorrect, move cursor to first address digit and enter address. Then enter zero for first data digit.
2. If address is correct, move cursor to first data digit and enter zero.
3. Press ENTER key.

START UP PROCEDURE

N O T E

This procedure should be used to a) start the station for the first time, b) restart the station after a power loss, or c) clear out memory for complete system reprogramming.

a. **Turn on battery voltage by pressing black button on back of Cue Speaker Unit.** Red lamp indicates power on.

b. **Press STOP switch on 901 Control Unit.**

N O T E

The operator can continue with this procedure in either of two ways, that is, with the crystal clock stopped or with the crystal clock running. Step c below stops the crystal clock. If the clock is NOT presently set, then step c can be performed without taking the clock out of synchronization. However, if the clock is presently set and running, then step c will interrupt its operation and thereby require a reset. The operator can avoid this by skipping step c and performing steps d, e, and f. However, these steps must be completed before a new minute comes on the display. If the procedure is not completed in time, another minute can be obtained for completing the procedure by pressing RESET button on the 903 Memory Unit subpanel.

c. **Place toggle switch on 903 Memory Unit subpanel at CLOCK SET.**

d. **Press CLEAR Memory pushbutton on side of subpanel—this clears the entire 903 memory.**

e. **Press RESET pushbutton on top of subpanel.**

f. Press KEYBOARD switch on keyboard unit, and enter at least one audio device into the format area of memory.

g. If step c was performed, return toggle switch to RUN.

CLOCK SET PROCEDURE

N O T E

The crystal clock is calibrated to plus or minus two seconds per month. An accurate external standard should therefore be used for setting the clock to current real time.

a. Open 901 Control Panel and place toggle switch on 903 Memory Unit subpanel at SET CLOCK position.

b. Press KEYBOARD switch on 903 keyboard.

c. Press CLEAR key twice to move blinking cursor to first digit of HRS display.

d. Press Left Arrow key to move cursor to DAYS display.

e. Key in correct day, hours, minutes, AM (0), or PM (1), and seconds, in advance of current real time.

N O T E

Keyed in numbers for day, hours, and minutes, either on the display simultaneously at the TIME OF DAY and the ADDRESS sections, the seconds are shown at the SOURCE/FUNCTION display.

f. Return toggle switch to RUN when correct real time equals the set display time.