NATIONAL RADIO ASTRONOMY OBSERVATORY
Green Bank, West Virginia

Telescope Operations Division Report No. 3

140 FOOT TELESCOPE CABLING SYSTEM

Lloyd H. Hunter, Jr.

NOVEMBER 1968

TABLE OF CONTENTS

CABLE NUMBER	CABLE	CABLE USE
1	4/C #8	Reg & Un Reg AC
2	4/C #8	Reg & Un Reg AC
3	4/C #8	Reg & Un Reg AC
4	4/C #8	Reg & Un Reg AC
* 5		
6	7/8 Spiroline	Feed
7	7/8 Spiroline	Feed
8	7/8 Spiroline	Feed
9	7/8 Spiroline	Feed
10	7/8 Spiroline	Feed
11	RG-9	Feed
12	RG-9	Feed
13	RG-9	Feed
14	RG-9	Feed
15	RG-9	Feed
16	1 5/8Spiroline	Feed
17	1 5/8Spiroline	Feed
18	15 Twisted Pair	Signal,Cal etc.
19	15 Twisted Pair	Signal, Cal etc.
20	15 Twisted Pair	Signal, Cal etc.
21	15 Twisted Pair	Signal, Cal etc.
22	4/C #14	He Refg Motor
23	16/C #14	Focus-Polarization Motor
24	12/C #22	Telephone System
25	4/C #8	Heat Pumps (DC)
26	4/C #8	Heat Pumps (DC)
27	4/C #8	Heat Pumps (DC)
28	15 Twisted Pair	Sig Cal, etc.
29	15 Twisted Pair	Sig Cal, etc.
30	36/C #20	Focus Encoder
* 31		
32	36/C #20	Polarization Encoder
* 33		
34	10/C #18	High Voltage
35	RG-9	Occultation Receivers
36	RG-9	Occultation Receivers
37	RG-9	Occultation Receivers
38	RG-9	Occultation Receivers
39	RG-9	Occultation Receivers
40	RG-9	Occultation Receivers
41	RG-9	Occultation Receivers
42	RG-9	Occultation Receivers
43	30/C #16	Cal,AC.etc FE Rack
44	30/C #16	Cal,AC.etc FE Rack (Front End)
45	RG-9-HV	HV Ion Pump, Any Station

* Note; Numbers 5, 31, 33 Removed From Telescope.

CABLE TERMINATION POINTS

CABLE NUMBER		FOCAL POINT	CONTROL ROOM
1	4/C#8	S E Leg-Bulkhead	QWL Connector Windowbox with jumper to Sta # 1
2		"	Station 2-Bulkhead
3		"	Station 3-Bulkhead
4		"	Station 4-Bulkhead
5			
6	7/8 Spiroline	S W Leg-Bulkhead	Bulkhead Window Box
7	"	"	"
8	"	"	"
9	"	"	"
10	"	"	"
11	RG-9	N W Leg-Bulkhead	"
12	"	"	"
13	"	"	"
14	"	"	"
15	"	"	"
16	1 5/8 Spiroline	"	"
17	"	"	"
18	15 Twisted Pair	N E Leg-Bulkhead	Station No 1
19	15 Twisted Pair	"	Station No 2
20	15 Twisted Pair	S W Leg-Bulkhead	Station No 3
21	15 Twisted Pair	N E Leg-Bulkhead	Station No 4
22	4/C#14	S W Leg-Bulkhead	He Rfgr Pwr Sup Tail Bearing
23	16/C14	N E Leg-Bulkhead	Window Box Ter Strip to Focus-Pol Control Rack
24	12/C#22	Focal Pt(Moveable)	Telephone Control Console
25	4/C#8	S E Leg-Bulkhead	Heat Pump Power Supply Cab
26	"	"	"
27	"	"	"
28	15 Twist	N E Leg Bulkhead	Sta #2
29	15 Twist	" " "	Std Back End Station
30	36/C#20	S E Leg-Bulkhead	Elco 38 pin Focus Translator
31			
32	36/C#20	S E Leg-Bulkhead	Elco 38 pin Polz Translator
33			
34	10/C#18	N E Leg-Bulkhead	Window Box Term Strip with jumpers to Sta No 1 and 2
35	RG-9	Occultation FE Box (Front End)	Occultation Back Ends (3)
36	"	"	"
37	"	"	"
38	"	"	"
39	"	"	"
40	"	"	"
41	"	"	"
42	"	"	"
43	30/C#16	N E Leg-Bulkhead	Window Box QWL Connector Jumpers to Sta 1 ,3 and 4
44		S W Leg-Bulkhead	Sta No 2
45		Long Cable (Moveable)	Any Sta (Moveable)

CABLE NO 1-4 TYPE 4/C # 8

COLOR CODE	Pin No	USE
Black	A	UN REG AC
RED	B	UN REG AC
SHIELD	C	
WHITE	D	REG AC
GREEN	E	REG AC
	F	NOT USED
	G	NOT USED

CONNECTORS

FOCAL POINT CABLE QWL 10-194624-10S
" " Bulkhead QWL 10-194424 Feed Through Socket end exposed
Control Room Cable QWL 10194624-10P
" " Bulkhead QWL 10-194424 Feed Through Plug end exposed

Note: In emergency Cable numbers 25, 26, and 27 wired identically and may be used in case of failure of any of above. Numbers 25, 26, 27 are primarily used for DC Power to heat pumps and are labeled as such at Focal Point.

CABLE NUMBER 6-10 TYPE 7/8 Spiroline CONNECTOR 97-875

CABLE NUMBER 11-15 TYPE RG-9 CONNECTOR UG-30C/U

CABLE NUMBER 16-17 TYPE 1 5/8Spiroline CONNECTOR 75-1625

CABLE NUMBER 35-42 TYPE RG-9 CONNECTOR UG-30C/U

CABLE NUMBER 45 TYPE RG-9 CONNECTOR UG-59-B-U

CABLE NUMBER 18-19-20-21-28-29 TYPE 15 Twisted Pair # 18

Color Code Per Pair	Color Code	Pin No
	Red	A
Blue Tracer- - - - -	Yellow	B
	Shield	E
	Red	C
Purple Tracer- - - -	Yellow	D
	Shield	J
	Red	O
Grey Tracer- - - - -	Yellow	P
	Shield	H
	Red	F
Green Tracer - - - -	Yellow	G
	Shield	M
	Red	T
Yellow Tracer- - - -	Yellow	U
	Shield	N
	Grey	K
Center Pair No Tracer-	Yellow	L
	Shield	R
	Blue	X
Center Pair No Tracer-	Yellow	Y
	Shield	Q
	Grey	Z
Center Pair No Tracer-	Red	a
	Shield	S
	Red	V
Center Pair No Tracer-	Yellow	W
	Shield	d
	Red	m
Black Tracer- - - - -	Yellow	n
	Shield	e
	Red	b
Orange Tracer- - - - -	Yellow	c
	Shield	k
	Red	r
Red Tracer - - - - - -	Yellow	s
	Shield	x
	Red	t
Brown Tracer- - - - -	Yellow	u
	Shield	y
	Blue	f
Center No Tracer- - -	Grey	g
	Shield	p
	Red	h
Center Pair No Tracer-	Blue	j
	Shield	q
		v
Spare Pins (3)		w
		z

Connectors;

Focal Point Cable QWL 81-194636-10S

Focal Point Bulkhead QWL 10-194436-10 Feed-through S End Exposed

Control Room Cable To QWL 81-194236-10P Bulkhead Type P

*Note: Bendix QWL Socket and Plug connectors are mirror images. Care should be taken to mate connectors with correct cable ends, in order to maintain pin numbers.

CABLE NUMBER 22 TYPE 4/C #14

COLOR CODE	PIN NO
Green	A
White	B
Black	C
Red	Not Used

Connectors

Focal Point Cable QWL 10-194622-9 S

Focal Point Bulkhead QWL 10-194422-9 Socket end exposed

Tail Bearing HE Refg Power Supply Panel

CABLE NUMBER 23 TYPE 16/C # 14

COLOR CODE	PIN NO	CONTROL PANEL
Red/Black	A	5
Green/Black	B	6
White/Black	C	10
Blue	D	11
Black/Red	E	17
Blue/White	F	16
Black	G	21
Green/White	H	22
Orange	J	30
White	K	32*
Red/White	L	29*
Red	M	31*
Green	N	39
Black/White	P	38**
Blue/Black	R	37**
Orange/Black	S	36
	T	—
	U	
SHIELD	V	

* FOCUS
**POLARIZATION

CONNECTORS:

FOCAL POINT CABLE QWL 81-194622-14S
Bulkhead FP QWL 10-194422-14 Feed Through Socket End Exposed
Jumper Cable to Sterling Mount QWL 81-194622-14P

Control Room To Focus and Polarization Motor Power Supply from terminal strip Window Box

CABLE NUMBER 24 TYPE 12/C # 22

COLOR CODE	TELEPHONE SYSTEM
Black/White Pair	Recvr Ring (Receiver)
Black/Red "	Xmitter Tip
B lack/Green "	Annunciator

Connectors

Focal Point; Terminated in Box with Phone Jacks provided for Headset.

Control Room; To Terminal in Control Console then to Phone Jacks for Headset and Heathkit Amplifier .

CABLE NUMBER 25-26-27 TYPE 4/C # 8

Color Code	Pin No	
Black	A	
Red	B	
Shield	C	
White	D	Telescope Cable
Green	E	
	F	Not Used
	G	" "

Note: These Cables used primarily for DC power Heat Pumps - in case of evergency - may be used for AC power as substitute for Cables Number 1-2-3 or 4.

Cables 25-26 and 27 run to Heat Pump Control Cabinet terminating with Plug QWL Connector. The Control Cabinet is wired with following Pins paralleled A and D; B and E.

Black	A	
REd	B	
Shield	C	Heat Pump Cabinet
White	D	
Green	E	

CONNECTORS

Focal Point QWL 10-194624-10S
FP Bulkhead QWL 10-194424-10 Socket End exposed

Control Room Cable QWL 10-194624-10 P
Bulkhead(HP Cabinet) QWL 10-194224-10S

CABLE NUMBER 30-&-32 TYPE 36/C # 20

COLOR CODE	PIN NO	ELCO
Red/Orange	A	A
Red/Red	B	B
Yellow/Blue	C	C
Yellow/Green	D	D
Red/Yellow	E	E
Blue/Brown	F	F
Yellow/Brown	G	H
Green/Brown	H	J
Yellow/Yellow	J	K
Red/Green	K	L
Brown/Violet	L	M
Red	M	N
Brown	N	P
Blue	P	R
Orange/Brown	R	S
Red/Blue	S	T
Brown/Slate	T	U
Orange	U	V
Yellow	V	W
Green	W	X
Red/Brown	X	Y
Orange/Black	Z	Z
Red/Violet	a	AA
Brown/Black	b	BB
Violet	c	CC
Black	d	DD
Brown/Brown	e	EE
Orange/Slate	f	FF
Red/Black	g	HH
Orange/Orange	h	JJ
Slate	j	KK
Orange/Blue	k	LL
Orange/Violet	m	MM
Red/Slate	n	NN
Yellow/Orange	p	PP
Orange/Green	r	RR
Shield	s	SS

CONNECTORS:
FOCAL POINT CABLE QWL 81-194628-21 S Jumpers to Encoders 81-194628-21P
FOCAL POINT BULKHEAD QWL 194428-21 (encoder end)

Control Room Terminal Strip W Box To Elco 38 pin Connector Control Room

CABLE NUMBER 34 TYPE 10/C # 8 HV 3000 Volts

COLOR CODE	PIN NO 8 PIN HV CONN
Black	1
Brown	2
Red	3
Orange	4
Yellow	6
Shield Red	
Shield Black	
Shield Orange	
Shield Brown	
Shield Yellow	
Green	5
Shield Green	
Blue	7
Violet	8
Shield Violet	
Gray	
Shield Gray	
Brown/Brown	
Shield Brown/Brown	
Overall Shield	

NOTE: Telescope Cable # 34,High Voltage, terminates on Terminal Strip in Window Box with jumper cable to 8 pin HV Connector at Station No 1 and Station NO 2 in parallel to pins as shown above. ONLY ONE STATION SHOULD BE USED AT ANY ONE TIME. UNUSED STATION SHOULD ALWAYS HAVE CAP OVER CONNECTOR FOR SAFETY.

CONNECTORS:

Focal Point Cable	QWL 72-435449-70 S	
FP Bulkhead	QWL 445513-70 P and S	Socket end Exposed
Control Room	Window Box Terminal Strip To QWL 445513-70 P Station 1 and 2	

Connectors Required for Jumper; QWL 72435449-70 S Control Room
" " P Focal Point

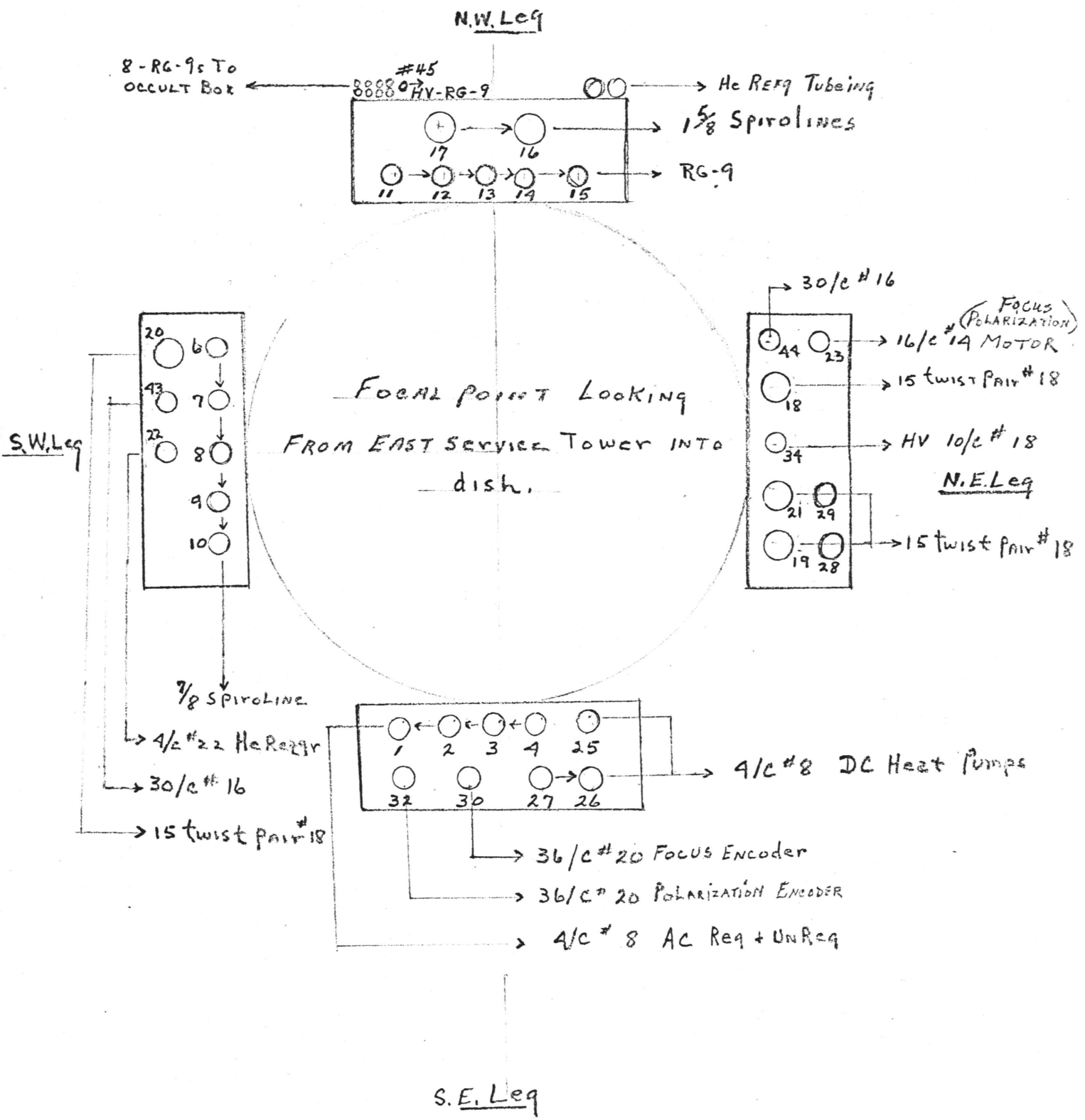
CABLE NUMBER 43 and 44 TYPE 30/C # 16

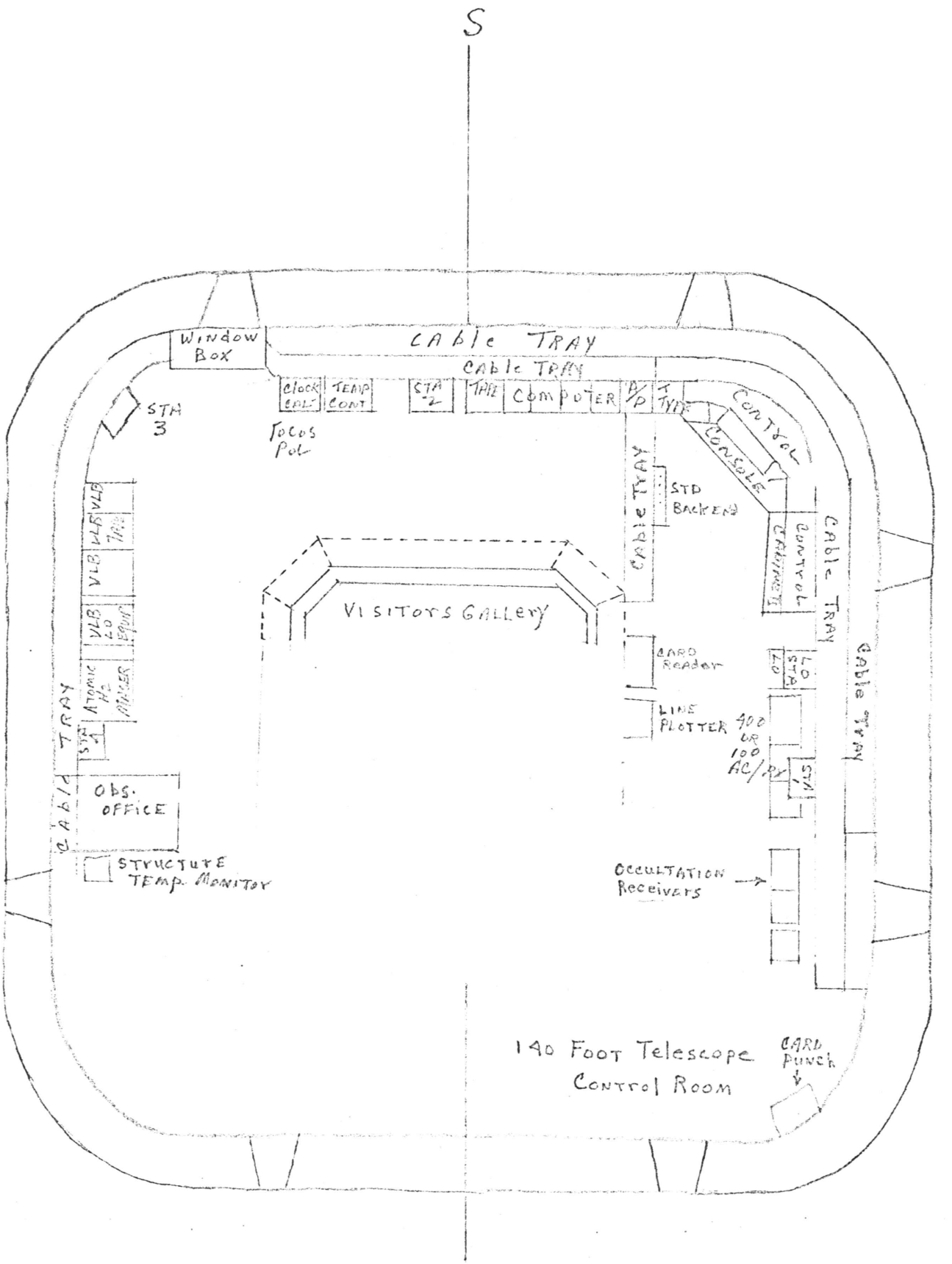
COLOR CODE	PIN NO
Orange/Purple	A
Orange/Blue	B
Yellow/White	C
Yellow	D
Red/Purple	E
Red/Blue	F
Orange/Green	G
Yellow/Black	H
Yellow/Brown	J
Black	K
White/Yellow	L
Red/Green	M
Orange/Yellow	N
Orange	P
Brown	R
Red	S
Red/Black	T
Red/Yellow	U
Red/Brown	V
Orange/Brown	W
Green	X
Orange/White	Y
Orange/Black	Z
Blue	a
Purple	b
Purple/White	c
Green/White	d
Green/Black	e
Green/Brown	f
Red/White	g
Shield	1

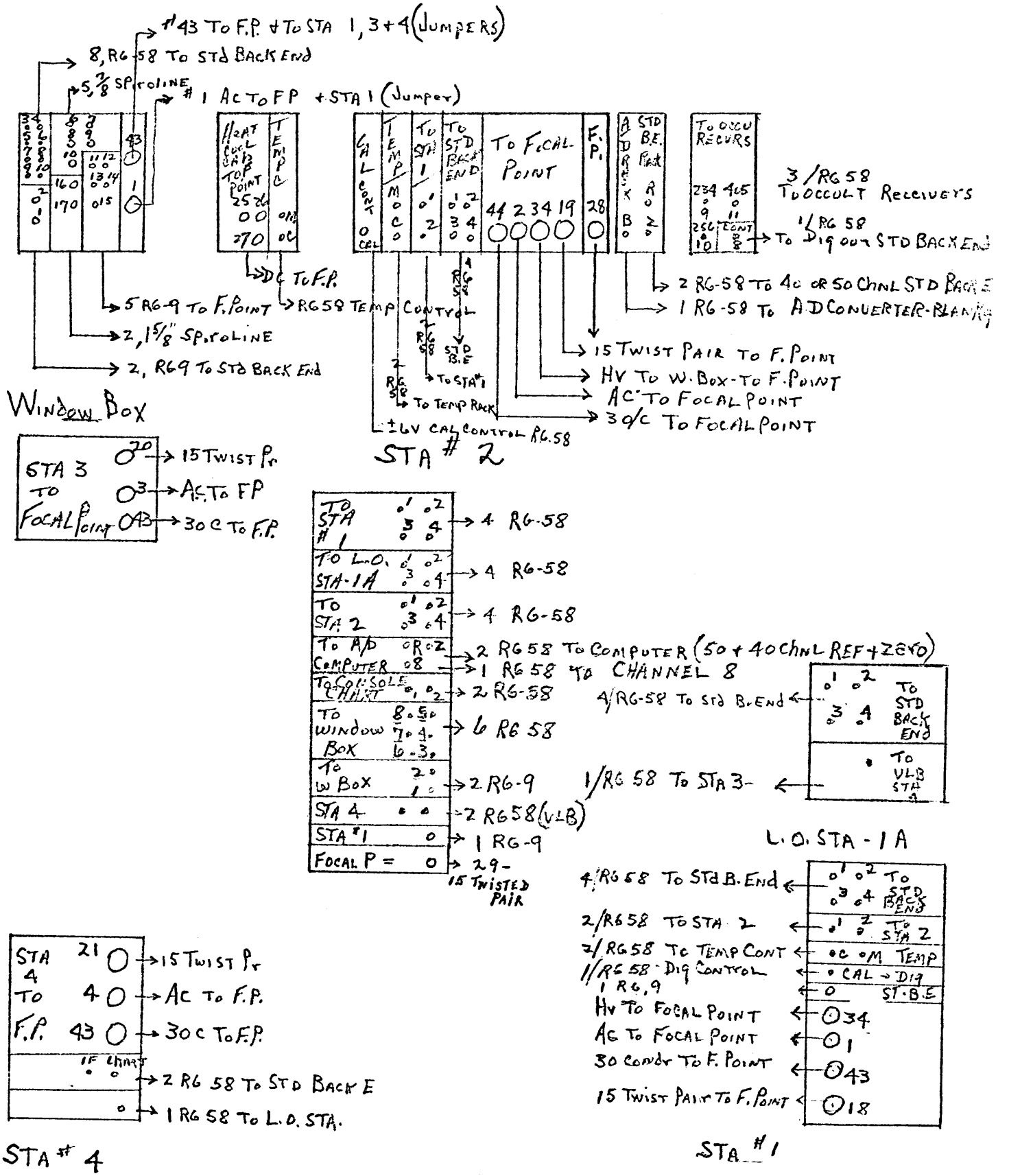
*Note; Bendix QWL Socket and Plug connectors are mirror images. Care should be taken to ma te connectors with correct cable ends.

CONNECTORS:

Focal Point Cable	QWL 81-194628-15 S	
FP Bulkhead	QWL 194428-21	Socket end Exposed
Control Room Cable	No 43 Terminates in Window Box Connector	
	QWL 81-194628-15 P	Cable
	QWL 194428-21	Bulkhead
	QWL 81-194628-15 S	Jumpers to Stations 1-3 and 4
	QWL 194228-15P	Bulkhead " 1-3 and 4
Control Room Cable	No 44	
	QWL 194228-15P	Station No 2


N.W. Leg
8 - RG-9s To Occult Box
#45 HV-RG-9
He Reg Tubeing
1 5/8 Spirolines
RG-9
17
16
11
12
13
14
15
30/c #16
Focus Polarization
16/c #14 Motor
15 twist Pair #18
HV 10/c #18
N.E. Leg
15 twist pair #18
44
23
18
34
21
29
19
28
20
6
43
7
22
8
9
10
S.W. Leg
Focal Point Looking From East Service Tower into dish.
7/8 Spiroline
4/c #22 He Regtr
30/c #16
15 twist pair #18
1
2
3
4
25
32
30
27
26
4/c #8 DC Heat Pumps
36/c #20 Focus Encoder
36/c #20 Polarization Encoder
4/c #8 AC Reg + UnReg
S.E. Leg


S
Window Box
Cable Tray
Cable Tray
Clock Ebl
Temp Cont
STA 2
Tape
Computer
B/P
T Type
Control Console
STH 3
Focus Pot
Cable Tray
STD Backend
Control Cabinet
Cable Tray
VLB
VLB Tape
VLB
VLB 20 Equip
Atomic H2 Maser
STA 1
Cable Tray
Visitors Gallery
Card Reader
LO STA
LO
Line Plotter
400 or 100 AC/DC
STA
Obs. Office
Structure Temp. Monitor
Occultation Receivers
140 Foot Telescope Control Room
Card Punch
Cable Tray



Control Room Hook up Stations

CABLE LENGTHS

SPIROLINES

73	Feet	Focal Point to skin
33	"	Skin to Dec Bearing
3	"	RG-9 Jumper - Dec Bearing
83	"	Dec Bearing to Yoke Hub
71	"	Yoke Hub through Polar Shaft
21	"	RG-9 Jumper Tail Bearing
77	"	Tail Bearing to Window Box
361	"	Total

Jumpers And Lengths Window Box to Stations

60	Feet	Station 1
20	"	" 2
10	"	" 3
25	"	" 4

No Jumpers in all other runs. 370 feet except Occultation RG-9 add Approx 20 feet to Occultation Front ends. Add distance from Window B ox to respective Stations.

PRESSURIZATION SYSTEM
FOR
SPIROLINE CABLES

The feed cables at the 140' telescope are pressurized with a dry air system. A manifold utilizing a needle valve and guage for each line is mounted on the outside of the window box in the control room. This arrangement permits a check on leakage of each line by closing the valve and observing the drop in pressure.

Since each line is on a separate guage, each calls for an individual hose jumper at the tail bearing and at the declination bearing. At the apex, all lines are plugged and none of them are interconnected. If pressurization is ever needed at the focal point (for horns, feeds, etc.) , it may be tapped from and one of the spiroline cables .

The pressurization system should be pressurized at 2-5 psi .

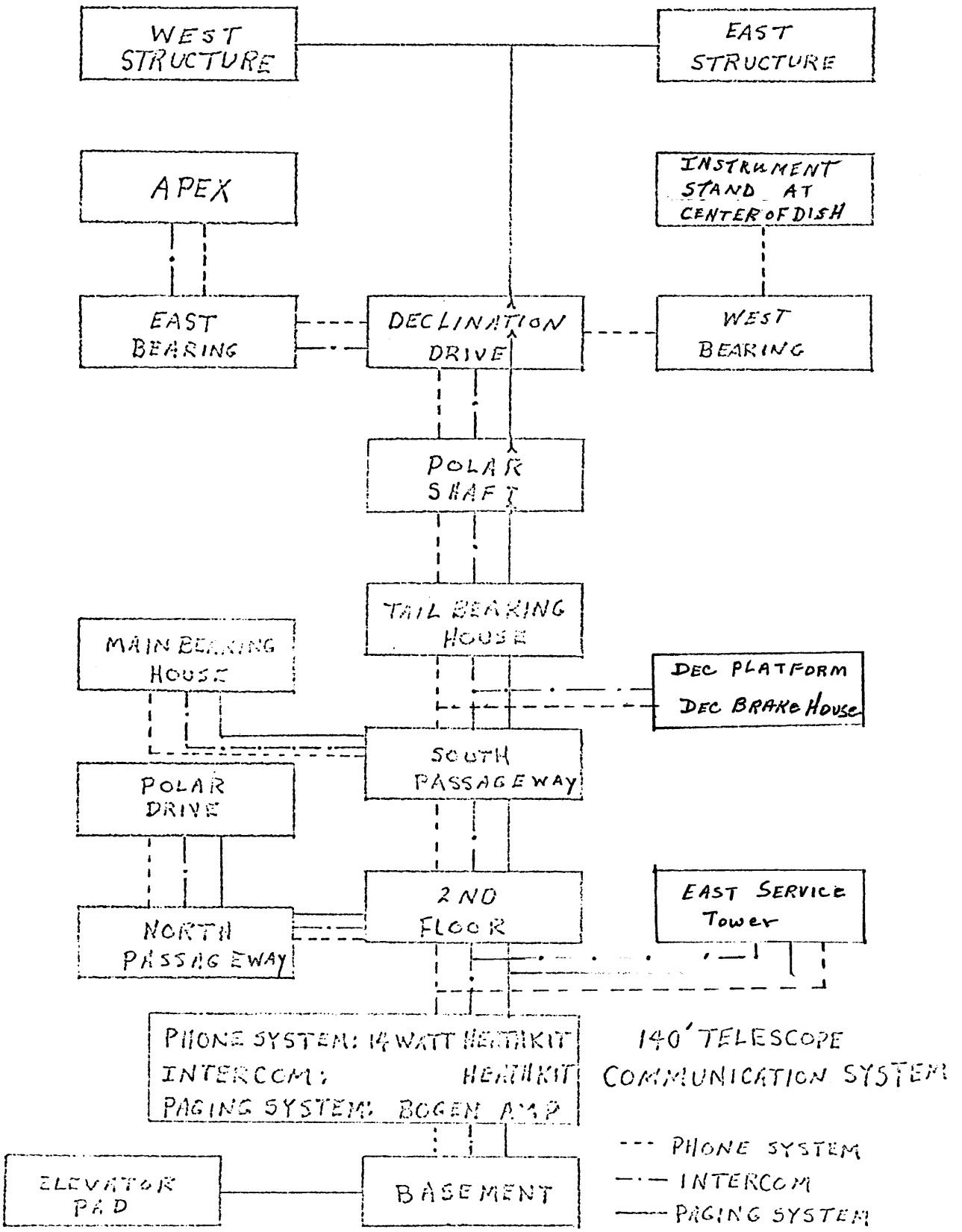
PHONE SYSTEM WIRING

RCVR RING - BLACK & WHITE

XMITTER TIP - BLACK & RED

ANNUNCIATOR - BLACK & GREEN

MARKE (CENTER OF DISH) - BLACK & YELLOW



NATIONAL RADIO ASTRONOMY OBSERVATORY

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October 28, 1969

MEMO TO: Addressee

FROM: J. F. Crews

REFERENCE TO: TELESCOPE OPERATIONS DIVISION REPORT NO. 3
"140 Foot Telescope Cabling System" by
Lloyd H. Hunter, Jr.

The attached pages should replace the corresponding pages in order to update or correct this report. They are - - pages 1, 2, 4, 5, 7, 13 and 15.