

### HD-SDI Transmission • New Proposal

**TCX-HD Series** have been newly released as the coaxial cable for HD-SDI transmission. Comparing with the existing TCX-HFBL, our customers can proudly enjoy wide-ranging features, especially the improvement in transmissible distance of HD-SDI signal as well as in its reliability. In addition, TACHII have added 2 types, TCX-2.8CHD and TCX-5CHD as our lineup of products developed for wider selection chances by our customers.

#### Longer transmission distance

New TCX-HD Series have made possible in the transmission distance of HD-SDI signal about 5% longer than the existing HFBL Series actual. Our customers can enjoy more higher reliability and minimized deterioration on the signal transmission.

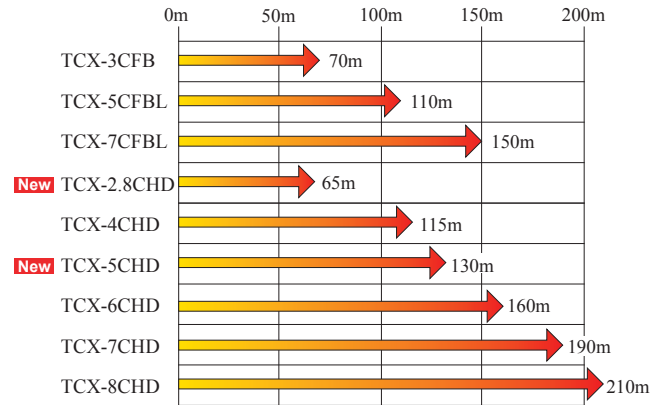
#### Easier cable leading

New TCX-HD Series can satisfy the better cable leading and make it possible to save the leading hour remarkably by employing higher hardness new materials as foamed core and outer sheath to cope with customers' requirement. In the existing HFBL Series, the reasonable hardness for cable leading is not sufficiently kept, the improvement has been requested.

#### Cable-end workability and restorability from the stress

New TCX-HD Series can make cable-end work significantly easier, keeping the same or performing more restorability from the bending stress or more than the existing type, by employing **non-adhesive type** against the foamed core for AL/PET Tape. The improvement was materialized by TACHII's repeated study and discussions on how to make it surely possible to keep the restorability available with adhesive type AL/PET Tape, which caused poor workability and required to remove it when cable-end works were going on.

Transmissible distance of HD-SDI signal  
(SMPTE 292M 1.485Gbps)



### TCX-2.8CHD Weight and space saving at wiring on racks and outdoor broadcast vans

Comparison TCX-3CFB vs. TCX-2.8CHD

	TCX-3CFB		TCX-2.8CHD
Cable O.D.	5.4mm	abt.18% thin →	4.4mm
Cable weight (100m)	4.0kg	abt.35% weight-saving →	2.6kg
HD-SDI Transmissible distance	70m ※1	equivalent level	65m

※1 general 3CFB is 65m

TACHII have developed TCX-2.8CHD as the coaxial cable for satisfying the thin and weight-saving requirement, keeping the attenuation character of 3CFB. TACHII have designed 2.8CHD strong enough against the outside pressure by employing high density polyethylen for foamed insulator and high hardness PVC for outer sheath. (See the details on Page 5 for the features and construction.)

2.8CHD has been able to settle the troubles such as extra stress caused from unreasonable cable bending or on the connector, which are happened due to high densitification on wiring hardly on racks, in addition, there are the load weight limit and radiation problem from the devices for the outdoor broadcast van. All the aboves are in use of 3CFB, which is relatively thin in size.

### TCX-5CHD HD-SDI transmission distance improvement      TCX-4CHD weight and space-saving on wiring

Over connection between broadcast devices, 5CFB is the most frequently employed. TACHII have improved 5CFB in view of 2 directions respectively, ①thin and weight saving ②transmission distance. Since 2 years ago, TACHII have already released TCX-4CHFBL to the market to cope with ① thin and weight saving, this time TACHII have succeeded in improvement of the attenuation character and now TCX-4CHD is on sale as a result. In addition, TACHII have developed TCX-5CHD, which has materialized to improve about 18% in ②transmission distance. Of course, TACHII have designed TCX-4CHD and TCX-5CHD strong enough against the outside pressure, same as TCX-2.8CHD

Comparison TCX-5CFBL vs. TCX-4CHD • TCX-5CHD

	TCX-4CHD		TCX-5CFBL		TCX-5CHD
Cable O.D.	6.5mm	abt.15% thin ←	7.7mm	equivalent level	7.7mm
Cable weight (100m)	5.0kg	abt.31% weight-saving ←	7.3kg	equivalent level	7.1kg
HD-SDI Transmissible distance	115m	equivalent level	110m ※2	abt.18% improved →	130m

※2 transmissible distance is 105m by the existing cable

## Coaxial cable for mobile application

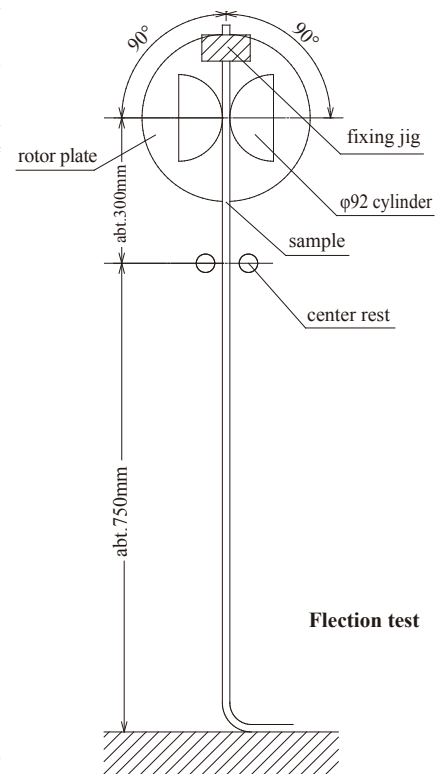
HD-SDI transmission is becoming the mainstream in the relay and studio uses etc., which require frequent removal and transfer of coaxial cable into and from, along with fixing application. Judging these background, TACHII have undertaken the development of best coaxial cable, in terms of superior flexibility, easy-to-use and longer durability, then have produced TCX-5CFWS employing **composite assembly conductor**. TACHII have succeeded in increasing flexion resistance to 2 times compared with 7-wire-assembly conductor, the composite assembly conductor as central conductor in flexible, flexion resistant application.

※ our internal evaluation base

Cable life comparison in flexion test by center conductor wise

	0	50000	100000	150000
TCX-5CFWS (Composite assembly conductor)	130000~140000			
General 5CFWS (Assembly wire conductor 7/0.36A)	60000~70000			
General 5CFB•5CFW (Single wire conductor 1/1.05A)	1300~1500			

<Flexing terms> Cable length: 10.0m  
 Flexion position: fix 60cm position from cable-end in rotor plate center  
 Flexion radius : 46mm (Cable O.D. 7.7mm × 6 times)  
 Flexion angle: Right and left 90° each (total 180°) (1 time means to right and from left)  
 Load: Own weight only abt. 750mm in height from the center rest



TACHII have also produced TCX-3CFWS suitable for HD-SDI signal transmission distance about max. 40m as our new lineup. By employing 7-wire assembly conductor as central conductor, the flexion resistance has been drastically improved, compared with single wire conductor. Because of lighter weight than 5CFWS, this is the best for short distance transmission.

### TCX-5CFWS

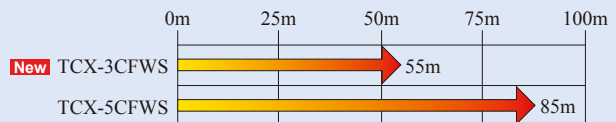
### TCX-3CFWS

### Improved usability and durability as jeep cable in relaying and studio

At first, 5CFB was used to employ as HD-SDI signal transmission for jeep cable at hookup fields and in studios. But, the AL/PET Tape, between braided shield and foamed insulator, is very weak in the mobile conditions and the deterioration is surprisingly developing by wrinkle and crack generated right after little use.

In order to overcome the situation, TACHII have employed **double braid** for outside shield. Besides, TACHII have employed, for the central conductor, **composite assembly conductor**, which is very effective for flex resistance (for 5CFWS only), in order to protect the attenuation deterioration and improve dramatically the durability. For foamed insulator, TACHII have employed low density polyethylene, which is superior in flexibility and restorability. As a result, the workability at the fields has been significantly improved. Due to their characteristics, 3CFWS and 5CFWS have been playing important role in various fields, not only as coaxial cable alone, but TACHII have also employed for RJP Series and SJP Series as composite multiple cable.

HD-SDI transmissible distance  
(SMPTE 292M 1.485Gbps)



#### TCX-5CFWS Features

- Excellent flex resistance  
(**Composite assembly conductor** employed)
- Flexibility is far better than 5CFB and 5CFW with single conductor specification, and workability in relay studio, etc. of course.

#### TCX-3CFWS Features

- Excellent flex resistance  
(**Assembly conductor** employed)
- Easier-to-use in fieldwork due to flexible finish, amazingly similar with microphone cable

## TIPS

### <Insulator material quality for coaxial cable>

High Density Polyethylene (HDPE) is abt. 0.95 min. in density, superior in attenuation character in high frequency, of very high hardness, therefore excellent material for permanent wiring. By contrast, flex resistance is poor, HDPE is not suitable for mobile applications due to cracking when loading just like repeated mobile case, etc.

Low Density Polyethylene (LDPE) is abt. 0.92 low in density, compared with HDPE, attenuation character in high frequency is a little bit poor. But, due to better usability and processing, LDPE has been used as coaxial cable for solid insulation from a long time ago. Compared with HDPE, LDPE is suitable for permanent wiring as well as mobile uses due to dramatically flexible and superior in flex resistance.

### Coaxial Cable Manufacturing Technology

#### Return loss management technology

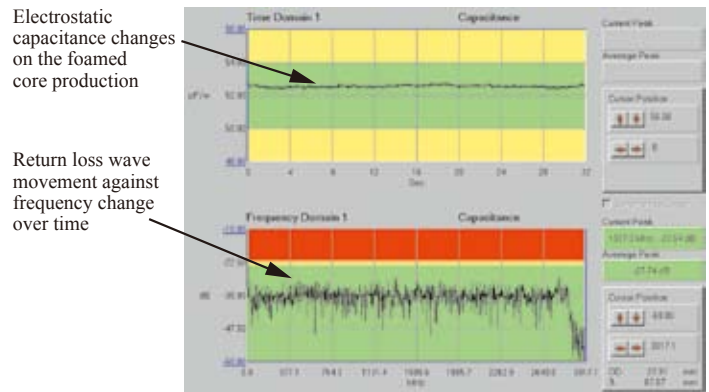
TACHII have produced our coaxial cable,insuaped for HD-SDI transmission, in accordance with our internal specifications to manage the return loss lower.In actual, TCX-HD Series have recorded the return loss as 20.9dB min.(1M~3GHz),this means more than 91% of the sending signal can be transmitted.

This specification has ample margin as return loss management figure at the sent/received terminals and can be easily compared with SMPTE292M, and ARIB BTA S-004B specifications.This is our reaction for the better return loss management, in consideration of getting worse when going through each connector to one cable by jack connector with several coaxial cables in transmission between the actual HD devices.

The graph on the righthand shows the screen example of the monitoring system by the fast Fourie-transform analysis for total inspection of return loss on the production process of coaxial cable insulator.The system can do total inspection and monitoring of the return loss value in the designated frequency band.

As far as homogeneous foam shaping on the core extrusion is obtained, very low and stable figure of the return loss shall be shown. Of course, the deterioration of return loss value maybe happened in the central conductor production process and braiding process etc. TACHII's know-how has been exercised in the respective process.TACHII, as the specialized manufacturer of coaxial cable, shall continue our very best effort so that TACHII can be the most reliable supplier for our customers.

Return loss mmonitoring system by the fast Fourie-transform analysis



Sample:TCX-5CHD Foamed insulator core production

#### Explanation on the return loss monitoring system by the fast Fourie-transform analysis

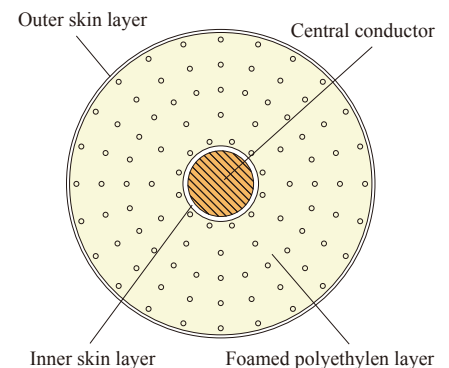
The wave pattern in the righthand graph shows the changes of electrostatic capacitance on the extrusion of insulation core forming.The changes are processed by computer on Discrete Fast Fourie Transform(DFFT), the return loss of insulator core is displayed in real time under the graph.The return loss has been always monitered whether the cable has been produced within the sufficient level against the specifications by inputting the designated value internally specified by cable model wise.

#### Foamed core production technology

The existing 3-type TCX-3CFB, 5CFBL, 7CFBL coaxial cable:TACHII have produced the foamed polyethylene insulation core with the chemical foaming sytem, most popular in Japan.The advantage of chemical foaming system is to make easily foamed polyethylene insulation core, provided that the insulation core is gradually changing at the very slow speed, even after the production process is finished.

To settle this negative point, TACHII have newly employed nitrogen gas foaming system, which has been used in the production of foamed core for TCX-HD Series. The gas foaming system is to force nitrogen gas into polyethylene under high pressure,TACHII have employed low density type polyethylene similar as the existing chemical foaming method and made 3-layer of inner skin, foamed polyethylene and outer skin for the above 3-type like TCX-HD Series. Because of this method, the finished products can be used with exactly the same feeling to handle the existing product (including cable-end processing), and the products reliability have been significantly improved.The additional advantage is in the improvement of attenuation character of coaxial cable by employing gas foaming system in the production.Due to no foaming agent is required,the insulator can be shaped by using more pure polyethylene, the improvement of attenuation character has been derived as a result.

TCX-5CFBL Gas foamed core section area



### TACHII's Policy for the hazardous substances to the environment

TACHII have also taken the responsible actions to protect the global environment. We have been registered by ISO14001 since January, 2003, aiming "The global environment-friendly manufacturing". To cope with RoHS Instructions exercised from July, 2006. TACHII have organized our own manufacturing system to minimize to the least possible the hazardous substances. Our customers can refer to the comparison table hereunder for the hazardous substances standard specs. between RoHS Instructions and our products'. TACHII have expressly marked *Pb free* together with usual statement on the surface of each cable as our own composition regulations on the hazardous substances. Our customers can safely use with confidence by this marking on each product, which indicates our products are in accordance with our hazardous substance regulations.

Standard Comparison of Max. Hazardous Substances Content

Hazardous Substance	RoHS Instruction Standard Value	TACHII's products own Standard
Lead	1000ppm	100ppm max. and intentional content disapproved
Mercury	1000ppm	Intentional content disapproved
Cadmium	100ppm	5ppm max. and intentional content disapproved
Hexavalent Chromium	1000ppm	Intentional content disapproved
PBB·PBDE	1000ppm	Intentional content disapproved

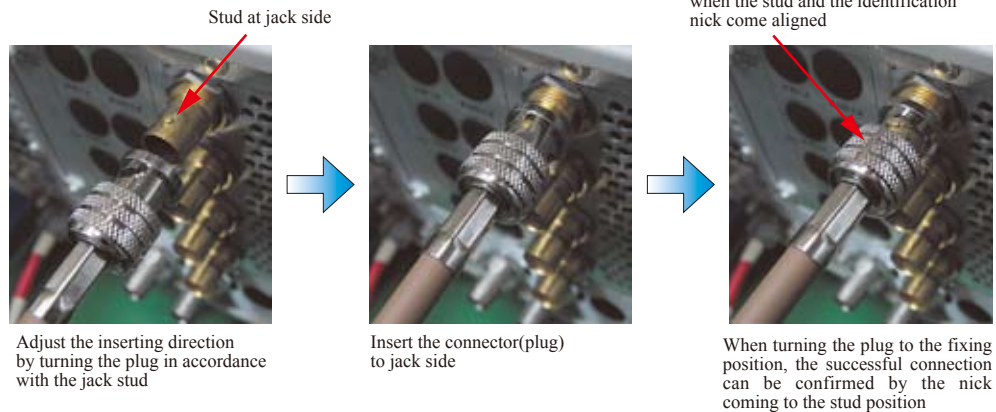
#### RoHS Instructions

(Restriction of the use certain Hazardous Substances in electrical and electronic equipment)

## BNC Connector Improvement of the fitting confirmation



Actual image of the confirmation when BNC Connector has fitted with jack side



Adjust the inserting direction by turning the plug in accordance with the jack stud

Insert the connector(plug) to jack side

When turning the plug to the fixing position, the successful connection can be confirmed by the nick coming to the stud position

So many devices in broadcasting stations are connected by millions of cables and connectors. All the expected functions can be properly worked when the cables have been certainly connected. If by any chance, any connector has not been surely fitted, such situation shall definitely cause accident in broadcasting.

TACHII have developed the BNC connector specialized only for TACHII's TCX Series coaxial cable use and got the Registration No.:1267387 for the Design. The control nick for identification is cut at the fitting spot on the jack side to make sure the connection with the jack side, far different from the existing BNC connector.

This newly employed design can help in the fields when the person in charge try to reconfirm the proper fitting of the cable without repeating insertion/removal of the connector. He/She can easily check with eyes from the cable side so that the workability and reliability in reconfirmation of connection can be significantly improved.

On top of this, TACHII have made the connector itself long type with design for workability to insert/remove of the connector. Please use them in the fields and enjoy the better work. (Refer to the product lineup on Page 13.)

## Improvement of reliability for the BNC connector, crimping type

In the past, the troubles in transmission could not be decreased, even though superior BNC connector was selected for corresponding to HD-SDI, with less reflection in the used frequency (low in VSWR character). Even if the coaxial cable is superior, the function cannot be sufficiently played when the matching is poor with the connector, the phenomena appear prominently especially in the HD-SDI signal taking care of high frequency in 1.5GHz band. That is the reason why TACHII have started to develop new BNC connectors specialized only for TCX Series, and produced with different designing philosophy from the general BNC connectors. TACHII's way of thinking is demonstrated by using BNCP-5CFBT specialized only for TCX-5CFBL. The hole diameter to insert the cable in the existing connectors was designed and produced to keep some margin and bigger size than the insulator core O.D. for coaxial cable. This design idea makes possible to insert to foamed insulation core even without removing the AL/PET Tape of outside shield on the cable.

Example Cable insulator core O.D. after removing AL/PET Tape :  $\phi 4.9\text{mm}$  Connector hole on cable :  $\phi 5.3\text{mm}$

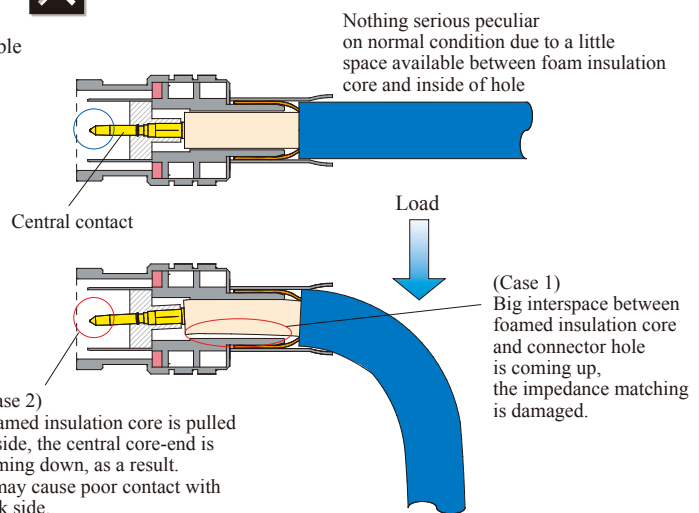
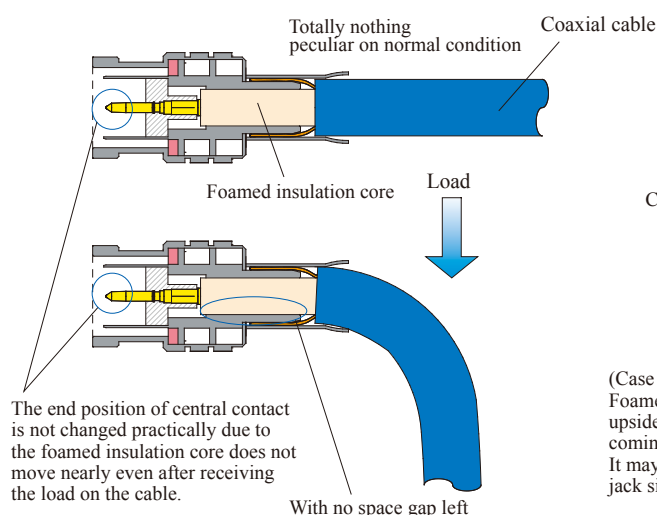
However, the processing to remove AL/PET Tape became the mainstream in the field, to avoid the possibility to short-circuit between shield side and central contact side with bear of cable-end, etc. in case of not removal of AL/PET Tape. When the AL/PET Tape was removed and the connector with bigger hole as the abovementioned was employed, if the load was on the cable side (refer to the figure undermentioned), the contacting edge was forced to bend downward as a result of the crimped part of the central contact crimped with the edge was pulled upward, by the effect of the cable bent due to the connector hole diameter bigger. This might cause loose connection between contacts themselves by the shape of the central contact at the jack side. **TACHII have designed and produced the connector, for the coaxial cable with AL/PET Tape, under the specifications to fit perfectly with the connector hole diameter on the condition of insulator core only after definitely removing the AL/PET Tape.** The connector, which take care the cable regardless removable of AL/PET Tape, cannot keep the characters and make sure the reliability. Even with this simple matter, this may cause trouble in transmission of the HD-SDI signal.



In the processing case of BNCP-5CFBT made by TACHII



In the processing case with the general connector (hole diameter is big)



※ Connector body, crimping sleeve figures are displayed by sectional drawing.